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Publications

MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF AN APPLICATION BY CANADIAN ARCTIC
GAS PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT
BE GRANTED ACROSS CROWN LANDS WITHIN THE YUKON
TERRITORY AND THE NORTHWEST TERRITORIES FOR THE
PURPOSE OF THE PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE
PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Whitehorse, Y.T.,

August 11, 1975.

August 12, 1975.

August 13, 1975.

PROCEEDINGS AT COMMUNITY HEARINGS

Volume 22

CANADIAN ARCTIC
GAS STUDY LTD.

SEP 15 1975

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APPEARANCES:

Ian Scott, Esq., Q.C.,
S.T. Goudge, Esq., & appear for Commission;
D. Carter, Esq.,
J.J. Marshall, Esq., appears for Canadian Arctic Gas
Pipeline Limited;
R.G. Gibbs, Esq., and
Mr. Hollingworth appear for Foothills Pipelines;
R. Veale, Esq., appears for Council of Yukon
Indians;
R. Anthony, Esq., appears for Canadian Arctic
Resources Committee;
G.W. Bell, Esq., appears for Indian & Metis
organizations of the Northwest
Territories;
J.U. Bayly, Esq., appears for Inuit Tapirisat of
the Mackenzie Delta.

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Whitehorse, Y. T.

August 11, 1975

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: Well ladies and gentlemen, I'll call our hearing to order. I am Judge Berger and I am conducting an inquiry into the proposal to build a gas pipeline to bring natural gas from the Arctic to markets in southern Canada and the United States.

There are, as you know, two pipeline companies that want to build the pipeline. One of them, Foothills Pipelines, wants to build a pipeline to carry gas from the MacKenzie Delta south along the MacKenzie Valley to connect with Alberta's natural gas system. The other company, Arctic Gas, wants to build a pipeline that would bring gas from Prudhoe Bay in Alaska along the north slope of Alaska and the north slope of the Yukon to the MacKenzie Delta and would join there with a line from the MacKenzie Delta and then the gas would be taken south along the MacKenzie Valley down through Southern Canada and the United States.

Now, I have been appointed by the Government of Canada under an order to consider what the impact would be in the Yukon and the Northwest Territories if this gas pipeline were built, and to make recommendations to the Government regarding the terms and conditions under which a gas pipeline should be built, if one is to be built.

1 The project is one that has
2 been described to the inquiry as the greatest under-
3 taking in history by private enterprise in terms of
4 the amount of money proposed to be spent. To examine
5 this proposal, I have been holding formal hearings in
6 Yellowknife and there we listened to the experts, the
7 engineers, the biologists, scientists and the lawyers
8 cross-examine them and it is something like a court
9 room or a trial. But I am also visiting each community
10 in the MacKenzie Valley and the MacKenzie Delta and
11 the Yukon likely to be affected by a pipeline if one is
12 built.

13 I was in Old Crow a month ago
14 because, of course, if the pipeline were built along
15 the interior route from Alaska, past Old Crow Flats and
16 through the Richardson Mountains, to the village of
17 Old Crow would be affected by the pipeline, so that is
18 why I went to Old Crow last month to hear what the
19 people who live there had to say about it. And I am
20 here tonight and all this week, that is every night
21 this week, to hear what you people who live in White-
22 horse have to say about it, because I think the views
23 of the people who live here in the north, who make the
24 north their home, are a cinch to any proper evaluation
25 of this project.

26 Now, there are two things that
27 you may want to talk about; one is the whole question
28 of alternate routes and we have been hearing evidence
29 all day today and we'll be hearing evidence again
30 tomorrow at 10 o'clock and each morning and afternoon

1 from a panel of experts who sit here during the daytime,
2 but we let them go in the evenings, who discuss the
3 possibility of bringing the gas from Prudhoe Bay down
4 through Fairbanks and then along the Alaska Highway
5 to Whitehorse, and then down the Alaska Highway to B.C.
6 to Alberta. Another proposal would be to bring the
7 gas down the Alaska Utility Corridor to Fort Yukon and
8 then across to Dawson and then down to Watson Lake,
9 down through B.C. and Alberta. These are some of the
10 proposals you might want to say something about because
11 if the pipeline were to be built on one of those
12 alternate routes, it would have a great impact on the
13 Yukon.

14 Now, I want you to understand
15 that ArcticGas doesn't want to bring the pipeline
16 through the southern Yukon or anywhere near Whitehorse,
17 they want to take the gas along the Arctic Coast to
18 the MacKenzie Delta and then down the MacKenzie Valley
19 to the south. If they can't -- if they are not allowed
20 to bring that gas along the Arctic Coast, they want to
21 bring it by what they call the interior route which
22 goes past the village of Old Crow and past Old Crow
23 Flats and through the Richardson Mountains to the
24 MacKenzie Delta.

25 Now, you may want to discuss
26 those things and if you do, I am anxious to hear from
27 you. You may want to discuss how they are going to
28 bring all of this equipment and material into the north,
29 because the project being so vast is one which will
30 require, for instance, one point one million tons of

1 pipe, and if it were to be purchased in Japan, some of
2 it might have to be brought through Skagway by sea and
3 then by rail or by truck to Whitehorse and then by
4 truck to Dawson and over the Dempster to the MacKenzie
5 Delta. Those are some of the issues that may interest
6 you, but let me make it plain that I want to hear from
7 you about any aspect of this pipeline proposal tonight
8 that you want to discuss with me. You don't have to
9 have a written brief, you just feel free to tell me what
10 you think about it, and to take all the time that you
11 need. We are not going to have any lawyers badgering
12 you or anything like that, this is just a conversation
13 between you and me.

14 I will ask you to be sworn,
15 however, and ask you if you wouldn't mind, to come
16 forward to this table where you can be seated at one
17 of these microphones or if you want to stand by one of
18 these microphones, you are welcome to do that too.
19 So, with that introduction I think I should tell you
20 that the people seated at the table at my right are
21 Miss Hutchinson, the secretary of the inquiry, who will
22 swear you in; the young ladies with the masks that they
23 keep trading are simply recording everything that you
24 say on tape so that it can be transcribed so there will
25 be a permanent record of everything that is said in
26 this inquiry, and so that I can go back and read and
27 re-read, if necessary, things you have said tonight that
28 deserve to be given further consideration.

29 The remainder of the people at
30 the table are the C.B.C. broadcasting team from

G. Wing

1 Yellowknife who broadcast the news of the inquiry each
2 evening for an hour over the northern service of the
3 C.B.C. in English and in Loucheux and Eskimo and Dogrib,
4 and Slavey, as well as Chippewayan. And the other
5 people at the table are members of the press, and the
6 people at this table appear to be members of my staff,
7 so don't be troubled by them.

8 So we are now anxious to hear
9 from you, and if you don't get a chance to be heard
10 tonight, I will still be here tomorrow night at 8
11 o'clock and each night this week til 8 o'clock until
12 everyone's been heard, so don't feel that if you are
13 not heard tonight that you won't be heard. If you can
14 make it tomorrow night or the next night, I will still
15 be here, so please feel free to go right ahead.

16 Yes sir, please come forward
17 if you don't mind. Take a seat here if you like and
18 just --

19 MR. WING: I've brought no evidence
20 your honour, but --

21 THE COMMISSIONER: Well, could
22 you give me your name and then you can tell me whatever
23 is on your mind.

24
25 GEORGE WING, Sworn:

26
27 MR. WING: My name is George
28 Wing. I've lived in the Whitehorse, Yukon area for
29 25 years.

30 THE COMMISSIONER: Go ahead,

1 Mr. Wing.

2 MR. WING: Everything we have
3 heard about this inquiry, we have got so far over T.V.
4 and one thing that bothers me, my friends and I think
5 most Canadians, is we have had several native people
6 get up and have threats of violence. They are going to
7 arm themselves, they are going to blow up the pipeline,
8 things like that. Well, most Canadians are law abiding.
9 Would this same privilege be granted to the white
10 community if they got up and said they were going to
11 hold up the pipeline by blasting and by arming them-
12 selves? Your lack of comment when the Indian Chiefs
13 got up and said this, either makes you condone it or
14 at least tolerate it, and threats like that have always
15 been against the law as far as I am concerned.

16 THE COMMISSIONER: Well, any-
17 thing else?

18 MR. WING: Well, do you condone
19 that? Are the white community allowed to bring these
20 same threats forward?

21 THE COMMISSIONER: Well let's
22 remember that this is an inquiry, and that I'm anxious
23 that people in each community and white people and
24 native people should have an opportunity of expressing
25 their views to me.

26 Now, it must be obvious that
27 there is very deep-seated opposition in native commu-
28 nities that I've visited to this pipeline proposal,
29 and some people have made statements that go very far.
30 Now, I'll have something to say about all of this in

1 due course, but that can only be when I turn in my
2 report to the Federal Government, and I am not in a
3 position to discuss every statement, extravagant or
4 otherwise, that anyone decides to come forward and
5 make, native or white, and we have had extravagant
6 statements from both native people and white people
7 during the course of this inquiry. My job is to make
8 sure that people get a fair hearing, and if in the
9 course of trying to make clear to me how they feel
10 about this pipeline proposal, they say things that other
11 Canadians may regard as objectionable, it is not for me,
12 certainly not for me at this stage to pass judgment
13 upon the things they have said. That is something I
14 can only do when I make my report to the Federal
15 Government.

16 In the meantime, of course
17 sir, it is entirely open to you as a citizen of this
18 country, to draw your own conclusions whatever they
19 may be. Now that I think is all I can say about that.

20 MR. WING: It isn't conclusion,
21 they presumably swore on a Bible that they would lay
22 down their life, they would blow up the pipeline, they
23 would arm themselves. Is this not a criminal offence?

24 THE COMMISSIONER: Well I am
25 not here to discuss the law with you. I'm sorry, I'm
26 here to listen to what people have to say about this
27 pipeline project and I'm not here to discuss with you
28 what people have said in other communities. I want to
29 hear what the people in this community have to say.

30 MR. WING: The same privilege

1 is granted to the white community without no recriminat-
2 ions or anything, like they are going to blow up an
3 Indian village, they are going to threaten the natives
4 and things like that? That's exactly what they did on
5 -- swore on a Bible.

6 THE COMMISSIONER: Well that
7 is something that you're entitled to have your own
8 judgment upon. I don't intend to pass judgment on any
9 aspect of this inquiry or on anything anyone has said
10 until I have heard everybody and until I am ready to
11 report to the Government of Canada.

12 Now, I don't think you and I
13 are going to get much further on this --

14 MR. WING: No, we are not going
15 to get very far. A crime has been committed in front
16 of you and nothing has been done about it.

17 THE COMMISSIONER: Well sir,
18 that is -- it was a crime committed, if it was a crime,
19 in the presence of hundreds of people, including if I
20 may be allowed to say so, the local R.C.M.P. officer,
21 and these are matters for the law enforcement authorities
22 and not for me, assuming that they are matters that
23 the law enforcement authorities feel come within the
24 purview of the criminal law, and not for me.

25 MR. WING: To comment?

26 THE COMMISSIONER: That is
27 what I've been trying to make plain to you for the last
28 few minutes.

29 MR. WING: Thank you.

30 (WITNESS ASIDE)

1 THE COMMISSIONER: Yes, sir?

2
3 CHRIS PEARSON, Sworn:

4
5 MR. PEARSON: My name is Chris
6 Pearson, and I am an officer of the local Whitehorse
7 Chamber of Commerce.

8 THE COMMISSIONER: Yes, Mr.
9 Pearson.

10 MR. PEARSON: Mr. Justice
11 Berger, the Whitehorse Chamber of Commerce is in
12 favour of the construction of a pipeline or pipelines
13 to transport the gas resources of the north to the
14 southern parts of the continent. We do feel, however,
15 that although any pipeline constructed might be used
16 jointly by our friends, the Americans, to get their
17 Prudhoe Bay gas to southern markets and by producers
18 of Canadian gas from the Delta and Eagle Plains' areas,
19 such origins of the gas should be closely monitored
20 and Canadian produced gas should be used only for
21 Canadian industry.

22 We are saying, in effect, that
23 we do not think Canada should sell any more of this
24 non-renewable resource but should rather maintain it
25 for our own use and benefit. We also think that the
26 Federal Government should announce immediately their
27 intention respecting the granting of a permit to con-
28 struct a pipeline, notwithstanding that a decision as
29 to a route may be sometime forthcoming. This early
30 announcement would assist business enterprises in the

1 north in their long range planning and would allow for
2 some sort of orderly growth to meet the additional
3 demands for services when required by the pipeline
4 construction.

5 We are hopeful, sir, that a
6 lesson has been learned by the Alaska experience and
7 that every effort will be made to pace the construction
8 of pipelines in Canada's north, so that the boom-bust
9 effects on local economies can be avoided.

10 The Territorial economy is
11 principally supported by mining, tourism, service indus-
12 try and government. If the construction of a pipeline
13 is allowed to proceed at the rate that the Alaska line
14 is being built, all of these local industries will be
15 faced with labour shortages and/or tremendously in-
16 creased labour costs to retain their employees. The
17 strain on existing facilities will force prices upward
18 drastically and the existing wage earners will be
19 forced to leave or seek wages which enable them to keep
20 up with the much higher cost of living.

21 We can visualize the mass
22 departure of teachers, civil servants and all those on
23 fixed income who cannot benefit in an entrepreneurial
24 way from the boom economy. This would be a tragedy in
25 that the Yukon has only recently begun to acquire a
26 stable population of skilled people.

27 The government's role, insofar
28 as Yukon is concerned, should be if a pipeline is
29 decided upon, to upgrade the transportation facilities
30 in the Territory. Careful planning is required here

1 so that the facilities built or expanded are not only
2 for the pipeline but for the long term use of the mining
3 and tourist industry. The government should be
4 encouraged to complete the Dempster highway at the
5 earliest possible date to facilitate the construction
6 of the pipeline.

7 The legacy of an upgraded
8 transportation system will perhaps be the only positive
9 side of the pipeline for Yukon. The routing of the
10 pipeline near Old Crow will have a very severe impact
11 upon the people of that community. This consideration
12 should weigh heavily upon the route designers before a
13 final decision is made.

14 The Chamber feels that that
15 way of life will probably not survive all the variety
16 of pressures of the Canadian way of life in any event,
17 and that the routing of the pipeline near Old Crow
18 will only hasten the inevitable. Therefore, if the
19 choice is between no pipeline or the preservation of
20 Old Crow as a traditional Indian community, we can
21 only feel regret for Old Crow, and we would respect-
22 fully suggest that serious consideration should be
23 given to using the existing transportation corridors,
24 the highways, as a possible route for the pipeline.
25 We fully realize the additional distances involved but
26 suggest that there might be considerable saving, both
27 financially and ecologically to using the established
28 corridors.

29 The major plus factor as far
30 as we are concerned is, of course, the probability of

1 getting reasonably priced natural gas for our local
2 industry. Every effort should be made to allow north-
3 erners to train for jobs resulting from the construct-
4 ion of the pipeline. We would prefer to see these
5 people training for jobs that will be permanent rather
6 than during the construction phase.

7 It is undesirable to create
8 appetites for large pay cheques which cannot continue.
9 Again, a longer term view by the government is re-
10 quired.

11 The government should also
12 ensure that the maximum possible northern content in
13 sub-contracting, engineering and freighting or at least
14 that those northern companies who wish to participate
15 in the construction are given that opportunity.

16 We appreciate this opportunity
17 to present this brief to the hearing, sir, and we wish
18 to commend the Commission for the thorough manner in
19 which you are seeking the views of northerners who,
20 after all, have the most to lose or gain from the con-
21 struction of a pipeline.

22 Thank you.

23 THE COMMISSIONER: Thank you,
24 Mr. Pearson. You could leave your statement with us
25 and it will be marked as an exhibit and form a part of
26 the permanent record of the proceedings.

27
28 (WITNESS ASIDE)
29
30

(SUBMISSION BY THE WHITEHORSE CHAMBER OF
COMMERCE MARKED AS EXHIBIT C-174)

THE COMMISSIONER: I should add that I have invited representatives of both pipeline companies to be here to listen to what you have to say, because I think they should listen to what you have to say, and to answer any questions you might want to ask them. But I am interested in hearing what you people have to say, so if there are any others who wish to step forward and say something, please feel free to do so. We are used to these long pauses, so it doesn't distress me so don't let it distress you.

AL WRIGHT, Sworn:

MR. WRIGHT: Sir, I'll have to ask first of all, your indulgence as Commissioner. It sometimes takes me a little longer than it does some others to say what I have to say, which might help the evening along, but I hope that in the end -- I hope that in the end what I have to say will also be worthwhile.

My name --

THE COMMISSIONER: It won't take any longer than some of the people I've heard. Could you give me your name, sir?

MR. WRIGHT: Yes, I was just about to. My name is Al Wright. I wear a few hats in this town. I'm -- for one thing I'm an alderman of the

A. Wright

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1 City of Whitehorse. In fact, the last time I was in-
2 volved in a meeting in this room, it ended up by costing
3 the government a bit of money because I had an argument
4 over the Robert Campbell bridge, which I think I won.

5 I am also, and this is the
6 reason I would like to appear before you to express a
7 few of my thoughts, for approximately 30 years I have
8 been involved in the building of highways in the north,
9 about half that time in the Yukon. I did the original
10 reconnaissance of the Dempster Highway, in fact in
11 February, 1958, I worked for the Department of Public
12 Works in Ottawa. I was given three days to get my
13 affairs in order and come tearing up to the Yukon because
14 a great crash program had just begun, the construction
15 of the Dempster Highway, and that was approximately 16
16 years ago. But in spite of that, the Dempster Highway
17 is still proceeding and still in, pretty well along the
18 route that was recommended in my reconnaissance
19 report.

20 So I was also -- I stayed --
21 I hope you don't mind this little bit of explanation,
22 I want --

23 THE COMMISSIONER: No, not a
24 bit.

25 MR. WRIGHT: I want to set a
26 little bit of the background. In 1973, I worked for
27 D.P.W. in the MacKenzie -- on the MacKenzie Highway. I
28 did a field location for them of the piece of road
29 between Fort Simpson and Camsell Bend, and I was also
30 involved at that time with establishing contact with

1 the gas pipeline locators. The usual thing that
2 happened, that very often happens when the government
3 gets involved with great speed, there had been no
4 communication at all between the route selection being
5 done at that time by Gas Arctic for their pipeline and
6 the route of the MacKenzie Highway. The result is in
7 some parts of the MacKenzie Valley, for instance in
8 the Norman Wells area, there's only about one obvious
9 route location, so of course the highway and the
10 pipeline are found exactly on the same course. Some-
11 body obviously had to yield and we did agree that we
12 should try to keep them at least a thousand feet apart,
13 and it was only at that time though that any real
14 thought was given as to the relative location of the
15 two lines.

16 Now, out of this, I explain
17 this so that you will know that I am -- a lot of what
18 I am going to speak of, I am not going to speak that
19 much, but some of the comments that I propose to make
20 are from first-hand experience and the knowledge of
21 the terrain of the corridors, both in Alaska -- in
22 Alaska, in the Yukon and in the Northwest Territories.

23 The first thing, sir, that I
24 would like to do, I would like to ask, is that no
25 matter where the pipeline goes, and no matter which
26 route it follows, that the restrictions on the con-
27 struction of it be based on common sense. When the
28 MacKenzie Highway was first proposed, it was a real --
29 it, like the Dempster Highway, was a real crash program,
30 though it hasn't got as far as the Dempster yet. I

1 think it is almost, for the moment it is almost dead.
2 The fact remains that it was a crash program, it was at
3 a time when ecology had become the in word and every
4 environmentalist and so-called environmentalist in the
5 country, suddenly began to descend on the -- for one
6 thing, on the D.P.W. office in Edmonton, and in fact,
7 we eventually evolved a phrase. It said to the effect
8 that a northern expert was anyone who had crossed the
9 60th parallel once, and then we discovered that some of
10 them hadn't even made the first crossing, but still
11 there were a lot of experts.

12 So, the first thing I would
13 like to -- as a result of considerable experience in the
14 country and on the building of roads, et cetera, and
15 a knowledge of the country, is that there is not a
16 sudden change in terrain just because you cross the
17 60th parallel. What I am attempting to say is that
18 we must -- that as some of the routes, for instance
19 large sections of the routes that are followed by -- of
20 the route of the Alaska Highway, is in reasonably good
21 ground. The construction of the Campbell Highway, for
22 example in the Yukon, involved very few of the problems
23 that would not be encountered in a highway anywhere.
24 There was very little problem of permafrost, there was
25 quite a problem of muskeg. So the point I am attempt-
26 ing to make is that just because you have crossed the
27 60th parallel, everything in the environment does not
28 suddenly become fragile.

29 Another thing, some of the --
30 there was almost, when the MacKenzie Highway, when the

1 location began, it almost reached a panic situation.
2 We were not -- I was using a cat to cut a line between
3 Fort Simpson and Camsell Bend, and we were not allowed
4 a second chance, you had to -- if you happened to make
5 an error in turning an angle or in a forward calculation,
6 you were stuck with it. The country in that
7 terrain, that area, the terrain is really not all that
8 bad. The point I am attempting to make, and I keep
9 coming back to this, you might begin to wonder if there
10 is one, but the one thing that I'm asking is that the
11 restrictions on the pipeline be according to the nature
12 of the terrain which the pipeline is following. In
13 other words, all the -- everything, all the terrain
14 north of the 60th parallel is not different and fragile
15 just because it's across a geographical boundary.

16 There were very some strange
17 restrictions which would affect a highway more than
18 they would a pipeline, I will admit, but one thing was
19 that a borrow pit or a borrow area, that is an area
20 from which the material will be obtained to use on
21 the road itself, had to be -- had to have a 300 foot
22 screen of trees between the edge of the right-of-way
23 and the pit, and to me, I never did understand what
24 that 300 foot screen would accomplish that a 50 foot
25 screen or a hundred foot screen would not. It meant
26 particularly in areas where material was scarce, that
27 you had to build an extra 300 feet of road just to get
28 the material to the edge of the right-of-way where it
29 would be used, and there were other restrictions on the
30 same line that to me would only add to the cost of the

1 road without an actual ecological saving or achievement.

2 So I wouldn't say that the
3 country must be respected in permafrost areas in parti-
4 cular, tight control of construction techniques must
5 be enforced, but these techniques are now reasonably
6 well known but please let us not have restrictions for
7 the sake of restrictions. Let's hope that they make
8 common sense and do not add unnecessarily to the cost
9 of an expensive undertaking.

10 There's just a couple of other
11 comments I would like to make. I, as a Yukoner, now I
12 speak as a Yukoner, I am interested that more use is
13 not -- or I am concerned that more use is not contem-
14 plated of the network of roads that we already have
15 here. The statement was made this afternoon, for
16 example, in regards to this corridor concept in that
17 say a second pipeline within -- say beside a road,
18 the comment was made that it would possibly have twice
19 the environmental impact. I think this was rather a
20 general statement, I think you also have to consider
21 the terrains which the road is passing. I feel, for
22 instance, that the -- that along most of say, the
23 Alaska Highway, that the impact of a pipeline would not
24 be -- I feel that because the people who live along
25 there are already to some extent attuned to the fact
26 that the original terrain has been disturbed by the
27 construction of the highway and the construction of
28 the community in which they live, and that the pollution
29 that is brought into the area by the tourists and some
30 of the development that takes place along that road,

1 is not -- is much more than the pollution, in my
2 opinion, would be caused by the contractors in the
3 area.

4 I read a story not too long
5 ago, some comments made by a group of Alaskans and
6 environmental people that paid a visit to the Alyeska
7 sites, and they commented that they couldn't even find
8 any waste paper in the area. But I assured them, and
9 I had just been over a considerable section of the
10 Alaska Highway, that if they want to find waste paper
11 and empty beer bottles and so on all along the highway,
12 they are certainly there and what I learned from my
13 last trip is that the most popular brand along the
14 highway is Labatt's Blue. The fact remains that there
15 is, that a great deal of pollution is caused by just
16 the fact that the highway is there in the first place.

17 I would like to see a little
18 more attention paid by the planners to the possible
19 use of the Dempster Highway and the Alaska Highway, as
20 possible pipeline routes. I would also like to remind
21 the people who are considering the mileages and the
22 difference in the number of miles in relation to say
23 the Fairbanks Corridor to the MacKenzie Valley Corridor,
24 is that there also are certain plans afoot and these
25 are partly in effect right now that will also cause
26 considerable -- excuse me, sir, on top of my other
27 problems I have new teeth. There are plans afoot in
28 the relocation of considerable sections of the Alaska
29 Highway that will considerably shorten the length of it.
30 These are things I hope that the planners all keep in

1 mind and are aware of to the very excellent engineering
2 report that was prepared by D.P.W. in 1964, I think
3 it was, an engineering study of the Alaska Highway. I
4 hope everybody involved in the planning of the pipeline
5 has had a look at that report.

6 I realize also that no matter
7 which way the pipeline goes, that the existing Yukon
8 Highway system will be used, I hope, in dealing with
9 some of their delivery problems and logistic problems
10 which will be extremely severe, that these will
11 complement the barge delivery of the MacKenzie River,
12 if that is used. And I hope that everything that --
13 anything that, any assistance that can be forthcoming
14 from the government, both the Government of the Yukon
15 and the Government of Canada, can be forthcoming will
16 be, and my chief hope is that sooner or later as part
17 of the development of the north that a pipeline is
18 built, that it is built by good engineering principles
19 with proper respect for the terrain, that it is not
20 harassed by regulations that really do not accomplish
21 anything.

22 Thank you, sir.

23 THE COMMISSIONER: Thank you
24 very much, Mr. Wright. I appreciate your submission
25 very much.

26
27 (WITNESS ASIDE)

28
29 THE COMMISSIONER: Anyone
30 else that feels they would like to say something about

D. Lloyd

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1 the proposed pipeline project, please feel free to come
2 forward and we are trying to be very informal here this
3 evening, though when you get a couple of hundred people
4 together, I guess it's difficult.

5 Yes, sir? Please.

7 DAVID LLOYD, Sworn:

9 MR. LLOYD: My name is David
10 Lloyd. I'm an environmental consultant. I've been
11 working with F.S. Slaney and Company for about five
12 years. We've been involved in a number of environmental
13 impact studies in the north.

14 THE COMMISSIONER: You said you
15 had been working with who?

16 MR. LLOYD: Slaney, S-l-a-n-e-y.

17 THE COMMISSIONER: Oh, yes.

18 MR. LLOYD: And in the last
19 two years we've been doing a considerable amount of
20 work doing environmental monitoring of construction of
21 pipelines in southern Canada, and while southern Canada
22 is different from the north in many ways, as Al Wright
23 said, there's not that much difference in many other
24 ways. And certainly in Eastern Ontario where the fine
25 clay soils occur, I think it's a reasonable parallel
26 to what would happen in many areas of the north.

27 The thing that I found about
28 pipeline construction was the extreme rapidity which
29 the pipeline crosses an area. The welders can do
30 -- could do about 2,000 feet a day in Ontario, and there's

1 no reason they couldn't do the same in the Yukon or
2 many areas of the north, certainly in the summer when
3 temperatures are just as warm. That means, 2,000 feet
4 a day means that a standard spread, which would be 90
5 miles, is that about the same as it would be on the
6 northern pipeline, 90 mile spreads?

7 THE COMMISSIONER: I'm sorry,
8 what did you say?

9 MR. LLOYD: Has anyone talked
10 about the distance which one contract would cover?

11 THE COMMISSIONER: Yes, yes.

12 Do you want to -- excuse me,
13 I think I should let you continue and complete your
14 statement and then I might ask the representatives of
15 the pipeline companies to comment. Would that be all
16 right?

17 MR. LLOYD: Yes.

18 The standard spread in Ontario
19 has been about 90 miles. If they weld 2,000 feet a day,
20 that means that that distance is covered in 45 days.
21 That's an extremely fast coverage, it means that all
22 planning and all communications must be well established
23 before construction starts. There is very little time
24 to communicate problems in the field, but at the same
25 time, pipeline construction is relatively flexible and
26 we found that when crossings of rivers with particular
27 fisheries concerns were done in a way which we hadn't
28 anticipated that they would, the construction contract-
29 ors were able to alter their planning to move their
30 equipment around the river and to wait until a better

1 time occurred, a time when proper -- or at least let
2 me say a more complete environmental review could be
3 done of the crossing.

4 So in summary, for pipeline
5 construction, I think we should all be aware of the
6 extreme rapidity and the need for planning of all
7 phases and a fair amount of communication -- a large
8 amount of communication before the construction starts.
9 Communication is probably the biggest problem because
10 most construction people aren't oriented towards read-
11 ing the material which is provided for them, so it
12 means that they have to have it illustrated in some
13 other way, whether by word of mouth, whether by slide
14 shows or whatever.

15 Again, if damage does occur
16 during the construction, the contractors are generally
17 flexible enough that they can move around an area that
18 it can be repaired for a short time while the system
19 is rectified. And then the clean up of the pipeline is
20 very fast. I was amazed how fast these people could
21 move, and how thorough their clean up can be as well.

22 In the north here, we've done
23 revegetation work near Faro, our firm has, and we've
24 done a number of environmental studies on the MacKenzie
25 Highway, on the Arctic Railway. I personally was in-
26 volved in coordinating those teams plus studies for
27 the White Pass and Yukon extension towards Faro, the
28 Skagway-Carcross road extension, and in those studies
29 I haven't seen any areas -- well let me say that I have
30 been in the field south of Fort Norman, and I haven't

1 seen any areas where the kind of construction they use
2 in Ontario would cause a lasting damage, and I believe
3 that the disturbance could be cleaned up probably in
4 the first year after construction, and within five years
5 of construction, other than a cleared swath, there
6 would be no recurring disturbance.

7 THE COMMISSIONER: Thank you
8 very much. You might just remain there for a moment
9 while I ask the representatives of Arctic Gas and Foot-
10 hills Pipelines if they want to say anything about any
11 of the matters you raised.

12 Mr. Hollingsworth?

13 MR. RUTHERFORD: I would like
14 to answer that question. First I want to --

15 THE COMMISSIONER: Yes, Mr.
16 Rutherford?

17 MR. RUTHERFORD: We didn't
18 prepare to come here.

19 THE COMMISSIONER: Well, Mr.
20 Rutherford, we're going to ask you to be sworn when
21 you answer this question, if you wouldn't mind?

22
23 RUTHERFORD Sworn:

24
25 MR. RUTHERFORD: I just wanted
26
27 to say, your honour, that we don't have any disagreement
28 with what this gentleman says. He's put it very well
29 for our pipeline project, and with regard to planning,
30 I don't think there's been a projected pipeline anywhere

1 that has had the planning that this one has had, so I
2 think we can --

3 THE COMMISSIONER: By "this
4 one", just so there is no misunderstanding --

5 MR. RUTHERFORD: Well I'll
6 speak for our own, I will let Mr. Horte speak for his.
7 I will speak for our own as far as we are concerned, so
8 we think his points were very well taken. As a matter
9 of fact, we think the points by everybody that has
10 spoken so far has been very reasonable and very well
11 thought out to us, and this gentleman's points are well
12 taken and I think he's stating that this pipeline
13 should have a lot of careful planning ahead of it.
14 That's one reason you're here, so we have no argument
15 with what he says at all.

16 Thank you.

17 THE COMMISSIONER: Well, fine,
18 thank you, Mr. Rutherford.

19 Mr. Rutherford is a vice-
20 president of Foothills Pipelines. I am right in saying
21 that, am I not?

22 MR. RUTHERFORD: Yes, I am
23 Executive Vice-President with them.

24 THE COMMISSIONER: Yes. Mr.
25 Carter?

26
27 (WITNESS ASIDE)

28
29 MR. CARTER: I will ask Mr.
30 Workman to deal with the question about the length of

1 the construction spreads.

2 THE COMMISSIONER: Yes, Mr.
3 Workman. Mr. Workman has been sworn in the past, he
4 answers a lot of these questions.

5 MR. WORKMAN: Well sir, regard-
6 ing Canadian Arctic Gas and the construction of the
7 pipeline, our plan is to construct it at a rate of
8 approximately a mile a day. This is a large project,
9 it will go faster probably than some pipelines that
10 have been constructed in other areas.

11 It was mentioned that the con-
12 struction in Ontario was taking place during the summer,
13 I would like to point out that in our proposal in the
14 north, we would construct the pipeline during the
15 winter. This is to assure that we would protect the
16 permafrost and the environment as much as possible. By
17 constructing it in the winter, we would maintain an
18 insulation over the permafrost and avoid any damage in
19 that respect.

20 THE COMMISSIONER: Mr. Workman,
21 while you are there, maybe I could just indicate and if
22 I have in anyway misconceived the evidence, you could
23 correct me, but for the benefit of the people here I
24 think it might be useful to you if I said that the
25 Arctic Gas project is essentially a four or five year
26 project. The laying of pipe would occur during three
27 winter seasons, that is over a three year period and
28 at this time they want to start laying pipe in the
29 MacKenzie Valley in 1978, and complete laying pipe in
30 the MacKenzie Valley in 1979, and lay pipe from Prudhoe

1 Bay to the MacKenzie Delta in 1980.

2 The point that you raised, sir,
3 was an interesting one. Arctic Gas, through its engi-
4 neers, has given evidence that they expect that product-
5 ivity of workers on the pipeline in the -- north of
6 the 60th parallel, will be less than it would be in
7 southern Canada, and for instance, they have suggested
8 to me that along the Arctic Coast, from Prudhoe Bay to
9 the MacKenzie Delta, productivity of each worker would
10 be approximately 60 percent what it would be in southern
11 Canada, owing to the climate and other conditions --

12 MR. LLOYD: During winter
13 construction.

14 THE COMMISSIONER: Yes, and
15 winter construction is what is contemplated by both
16 companies. At any rate, I am not trying to pass myself
17 off as an engineer, I'm just trying to repeat
18 some of the basic things in language that the people
19 here might understand.

20 You might also comment on this,
21 Mr. Workman. This is a 48 inch diameter pipeline, the
22 Arctic Gas pipeline -- the Foothills pipeline is a
23 shorter one because it doesn't go as far. The pipeline
24 would, if it were built, would run through permafrost
25 and to avoid the heat from the pipe melting the perma-
26 frost, which of course would make the whole pipeline
27 unstable, Arctic Gas and Foothills propose to chill the
28 gas which would -- they take the position that would
29 ensure that the permafrost would not be -- would not
30 melt, the permafrost around the pipe. The pipe would be

1 buried in a ten foot ditch with I think something like
2 six feet of fill on top of the pipes, and they want to
3 avoid melting the permafrost around the pipe.

4 That is, I hope, Mr. Workman,
5 put with reasonable accuracy?

6 MR. WORKMAN: You have explained
7 it very well, sir. Maybe I should add that the reason
8 for the large diameter pipe on the northern branch is
9 again to ensure that damage to the environment will be
10 kept at a minimum. Probably we could get away with a
11 smaller pipeline but the damage to the environment
12 really takes place during construction and we would
13 not want to put in a small pipeline on this branch
14 through the Yukon and then find that a few years later
15 on we would have to put another line in to handle the
16 capacity. So we have chosen to put in large diameter
17 pipe at this time, to take care of future requirements,
18 to avoid having to go through the construction phase
19 again at a later date.

20 THE COMMISSIONER: I might
21 just add one other thing. The Arctic Gas witnesses
22 have told us that there would be something like --
23 well, I have already said that the project would last
24 four or five years, and Mr. Horte, the president of
25 Arctic Gas, has given evidence before the inquiry and
26 has said that Arctic Gas would expect, after the con-
27 struction of the pipeline was completed, to build a
28 second gas pipeline up the MacKenzie Valley within four
29 or five years, and that the construction of the second
30 gas pipeline would take another four or five years.

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1 So that the project as conceived by Arctic Gas, so far
2 as it affects the MacKenzie Valley at least, is a pro-
3 ject that could last something like 10 or 15 years.
4 I'm summarizing what Mr. Horte has told us. You might
5 be interested in knowing that. Is that a fair state-
6 ment?

7 MR. WORKMAN: Yes, it's
8 dependent on the demand for gas --

9 THE COMMISSIONER: Yes.

10 MR. WORKMAN: -- and the avail-
11 ability of gas from the Prudhoe area.

12 THE COMMISSIONER: Well, thank
13 you, Mr. Workman and Mr. Rutherford. Did you want to
14 commend this witness as well?

15 MR. WORKMAN: We'll do that.

16 THE COMMISSIONER: Well, did
17 you want to add anything, sir?

18 MR. LLOYD: Nothing further.
19 Al did mention the comparison between a pipeline and a
20 highway. I have been involved in summer road construct-
21 ion in this recent pipeline work; I don't see any
22 comparison at all between the small amount of damage
23 which pipelines do over the short duration that they
24 are present, that construction is present.

25 THE COMMISSIONER: You mean
26 Mr. Wright compared the highway to a pipeline?

27 MR. LLOYD: That's right.
28 And compared to the duration that highway construction
29 occurs at the same site, and then the recurring use
30 over the same area.

1 THE COMMISSIONER: Yes, well
2 thank you very much, sir.

3
4 (WITNESS ASIDE)

5
6 THE COMMISSIONER: Does anyone
7 else care to come forward and say anything? If no one
8 does, I am going to wait a few more minutes, but if
9 no one does, I will still come back tomorrow night at
10 eight and see if all of you come back again and have
11 something to say at that time.

12 Well, is there coffee, Mr.
13 Waddell? Is it ready? Well we have coffee here so
14 I'll adjourn for 10 or 15 minutes and we can have a cup
15 of coffee and you can collect your thoughts and if you
16 have anything more to say after that, we'll carry on
17 til around ten and then come back tomorrow night. So
18 we will just stop for a few minutes.

19
20 (PROCEEDINGS ADJOURNED)

1
2 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

3
4 THE COMMISSIONER: Let's be
5 seated again, ladies and gentlemen, and just take a
6 moment to let you take your seats again.

7 Well, does anyone else wish
8 to say anything about the proposed pipeline project or
9 any aspect of it?

10
11 THOMAS NAIRN, Sworn:

12
13 MR. NAIRN: My name, sir, is
14 Tom Nairn. I'm employed by the Government of the Yukon
15 Territory, as the Territorial Fire Marshal, and I'm
16 wondering what consideration has been given in the
17 general planning of the concept of this pipeline as to
18 the safety standards which will be in existence by the
19 companies who will be constructing this line.

20 The reason I bring this point
21 up is that in the north, we have percentagewise, a
22 large concentration of mobile homes and construction
23 camps, and it has been my experience that this type of
24 business poses a threat insofar as the standards which
25 are in existence, namely the Canadian Standards
26 Association, Z-240 series, does not in actual fact
27 comply with the National Building Code. The National
28 Building Code is a standard which is recognized across
29 Canada for residential or stick built construction.
30 The end result is, it is my personal feeling that the

1 type of units, whilst all right on a temporary basis,
2 namely in the summer time, are not suitable for winter
3 occupancy. Our losses in the Yukon, and I believe
4 I can speak for the Northwest Territories, are out of
5 proportion in terms of the actual occupancy, and this
6 can be reflected in the insurance rates which are in
7 existence in the Yukon Territory. In other words, two
8 years ago we ran a survey as to insurance costs and contents
9 were three times as high in a mobile home as they are
10 in a conventional structure.

11 Also, the actual units them-
12 selves, costwise is approximately three times that,
13 the insurance rates that is, was higher than that in a
14 conventional structure. So what I'm really concerned
15 with is that you mentioned that this project possibly
16 may be extended over three to four, five years. I'm
17 wondering if, and I'm thinking on the lines of northern
18 Quebec where they had labour troubles last winter as
19 I recollect, fires were started and I think really
20 looking at it from a fire point of view, it was a com-
21 bination of closely grouped structures and possibly
22 structures which were susceptible to fire, and the
23 intent was, it was basically a temporary type of a
24 situation which would be rectified in a given period of
25 time.

26 But really what I'm interested
27 in is, is thought being given, either by the Federal,
28 the Alaskan, Northwest Territories or the Yukon Govern-
29 ments as to what they -- standards we will be looking
30

1 at. Will this be the responsibility of the Federal
2 Government to devise the means, namely spacial separat-
3 ion, the type of heating equipment, will these things
4 be self-contained in terms of fire protection, or will
5 the stress and strain be put on the provincial -- or
6 rather the Territorial Government to provide this fire
7 protection? The end result being that we may have to
8 increase our staff to combat the anticipated increase
9 in fires. It is on this basis, sir, that I would ask
10 the question, has thought been given to a standard of
11 fire protection for these temporary camps?

12 THE COMMISSIONER: You are
13 speaking of the construction spreads, and I think I
14 should say for the benefit of the people here, if you
15 will allow me to sir, that it is expected that there
16 would be about 800 men in each camp, and there would
17 be on the Arctic Gas system, how many camps north of
18 the 60th parallel, Mr. Workman?

19 Would you like to come forward
20 and comment on this point?

21 MR. WORKMAN: I believe north
22 of 60, there are contemplated about nine spreads.
23 We will certainly have our camps meet all standards,
24 whatever those standards may be, and I think a typical
25 example if anyone has been to Prudhoe Bay and had a look
26 at the facilities in that area, they would understand
27 just what is meant by adequate fire protection in this
28 type of camp. I think they probably exceed what any
29 government regulations might give, but I can guarantee
30 that Canadian Arctic Gas would certainly meet whatever

1 government standards would be set.

2 THE COMMISSIONER: Well, do
3 you want to comment on that?

4 MR. NAIRN: Yes sir. My
5 comment is that in actual fact there is no national
6 standard for mobile homes or construction camps. In
7 other words, it's somewhat fragmented and each province
8 has its own set of standards, and I would suggest that
9 in all probability that what should be done is that
10 there should be a committee set up possibly under the
11 Dominion Fire Commissioner, who in turn would liaise
12 with the various N.W.T. and Yukon and even Alaska fire
13 authorities, and arrive at a common standard for this
14 type of camp. So that if, as I visualize, this camp
15 is moving from Prudhoe Bay across the northern part of
16 Alaska into the Yukon and into N.W.T., then you maintain
17 this consistency, and we then would be aware as to what
18 is going to happen.

19 In other words, I can well see
20 certain amounts of sloppiness being introduced during
21 this rush factor, and if that is the case, then inevit-
22 ably there will be a loss of life and there may be a
23 tie-up in terms of unions becoming involved in safety
24 standards and this delay.

25 THE COMMISSIONER: Yes. I,
26 if I may say so, this hasn't come up, no one brought it
27 up. Now our formal hearings haven't yet reached the
28 stage where we would expect it to come up but I think
29 the point is well taken and Miss Hutchinson, I would
30 ask that you note this evidence for Mr. Scott,

1 Commission Counsel, and it can be brought to the
2 attention of Commission staff so that at the appropriate
3 stage your suggestion, which certainly appears to me to
4 be a very constructive one, can be taken into consider-
5 ation, so I want to thank you very much. I appreciate
6 that.

7 Thank you, Mr. Workman.

8
9 (WITNESS ASIDE)

10
11 THE COMMISSIONER: Does anybody
12 else wish to say anything? Yes, sir?

13
14 IRWIN ARMSTRONG,
15 Sworn:

16
17 MR. ARMSTRONG: My name is
18 Irwin Armstrong, and I've had considerable experience
19 in operating camps in the winter time for some of the
20 mining companies. I found that a two storey camp with
21 a social club was very effective in controlling moral
22 decline, and while I was up at Fort Radium, they brought
23 in a bunch of waitresses to cater at the mess hall.
24 When I first went up there, the men used to get drunk
25 and fight til the blood run down the floor, and after
26 they brought these waitresses in, the camp became kind
27 of half civilized.

28 I believe --

29 THE COMMISSIONER: I am
30 tempted to say why not?

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Go ahead, forgive me, I
shouldn't have interrupted you.

MR. ARMSTRONG: I believe the Indians are justified in being concerned about the social impact, and if they allow the camps to be operated as they have been here in the past, there could be lots of trouble, but I believe that if the religious organizations were on the ball, I am sure they could deal with the situation very effectively by employing my dad's version of Christianity.

There was a Roman Catholic priest at Cassiar made the statement over the radio sometime ago that all the churches had gathered up a lot of false ideas they were going to have to get rid of, or else our nation was going to be in serious trouble. And I think I can understand why. The Anglicans, and I believe the Mormons believe that the Negroes and the Indians are the children of Cain, when actually they could be the Canaanites themselves, and after my experience with the Indian people, I have come to have a real respect for them because the Indian people, that is the old timers, were honest and they were clean leaving. If you give them half a chance, you couldn't wish for better people, but the beer parlours and the cocktail lounges came in here and they did everything they could to hypnotize them and demoralize them, so it's no wonder the Indians are concerned about the present situation.

THE COMMISSIONER: Thank you
very much, Mr. Armstrong.

(WITNESS ASIDE)

THE COMMISSIONER: Well,
anyone else who would care to say anything?

Well, I think that what you
have said has been a valuable contribution to the work
of the inquiry. I think that since no one else is
anxious to speak this evening, we will adjourn until
tomorrow night at eight o'clock, and I certainly welcome
you all back at that time to say anything that you
wish to say or to listen to others who may have some-
thing to say, and I just want you to know that I take
the view that this inquiry can learn from each one of
you.

It isn't just an inquiry
where we listen to the experts; you can come and
listen to them along with me at ten o'clock tomorrow
morning, because we sit from ten until one here in
this room and then from 2:30 until 5:00, and we will
be sitting each day here to listen to the experts,
and I just want you to know that I will be back at
eight o'clock tomorrow night here to listen to
ordinary people like yourself and like me, who are
anxious to see that this thing -- this project is
evaluated as carefully and as closely as can be.

So I am going to adjourn the
-- this community hearing then until eight o'clock
tomorrow evening and the inquiry is adjourned until

1 10 o'clock tomorrow.

2 So thank you all for coming.

3
4 (PROCEEDINGS ADJOURNED TO TUESDAY, AUGUST
5 12th, 1975 AT 8:00 P.M.)
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Whitehorse, Y.T.

August 12, 1975.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: Well, ladies and gentlemen , I'll call our hearing to order this evening, and tell you that I'm anxious to hear anyone from Whitehorse or any of the other Yukon communities who wishes to speak tonight about the proposal to build a pipeline to carry gas from the Arctic to markets in Southern Canada and the United States. I should tell you that we are here in Whitehorse considering many things having to do with the pipeline, specifically whether the route by which gas from Prudhoe Bay is taken along the Arctic Coast and then down the Mackenzie Valley is the route by which the gas ought to be carried, or whether it ought to be brought down Alaska to Fairbanks and then along the Alaska Highway -- that is a pipeline running parallel to the Alaska Highway -- past Whitehorse, then down into British Columbia and Alberta. Those are some of the things that we have been discussing the last two days, but tonight if any of you wish to speak, you feel free to discuss any aspect of the pipeline proposal in all of its ramifications because I'm most anxious to hear from you. You don't need to have a brief or a written statement, simply feel free to tell me what is on your mind; and if there are not a great many of you with anything to say, I intend to call on the -- some of the witnesses who have been giving evidence today to carry on with their testimony, and when we reach that stage of the

R. McRobb

1 proceedings, you should feel free to remain and to
2 listen to what they are telling the lawyers, because
3 the lawyers will be questioning them; but when you, the
4 people who live here, make your statement now, I want
5 to tell you that no lawyers will be badgering you. We
6 just want to hear from you, and we want you to be
7 comfortable.

8
9 So having said that, I'll be
10 happy to hear from any of you who wish to make a state-
11 ment about this. Yes sir. Please feel free to move
12 to the microphone and we'll swear you in in the usual
13 way. Please be seated, sir.

14 RON McROBB, sworn:

15 THE WITNESS: Mr. Berger, my
16 name is Ron McRobb, and I'm the president of the Yukon
17 Transportation Association, and I have a couple of
18 pages here I would like to read.

19 THE COMMISSIONER: Fine, please
20 do.

21 A It's a letter dated
22 August 8, '75, addressed to yourself, and it starts
23 out:

24 "Dear Sir:

25 The Yukon Transportation
26 Association is an organization comprised of
27 representatives from the trucking, rail, air
28 and telecommunications industries in the Yukon.
29 Our carrier members operate on a local, inter-
30 provincial and international level. We are

R. McRobb

1 very much interested and concerned about possible
2 ramifications of a pipeline being constructed
3 anywhere in the north, and particularly in the
4 Yukon since transportation plays such a vital
5 role in any development undertaken. One
6 might say that transportation is the name of
7 the game here, as elsewhere in Canada's Arctic
8 and sub-Arctic regions.

9 It had been the intention
10 of the Association to have a brief prepared
11 for submission to you during your Whitehorse
12 hearings outlining our points of concern and
13 recommendations for your consideration. To this
14 end we held two special meetings to discuss the
15 areas of main concern in the hope of identifying
16 and isolating relevant facts peculiar to the
17 transportation industry for inclusion in the
18 brief. We wished especially to outline the
19 possible ramifications of a project of such
20 magnitude could have on the transportation
21 industry, and in general what safeguards we
22 as a credible Association, could recommend
23 to assist in the informative and planning
24 phases of any pipeline contemplated, irrespective
25 of its route. We found, however, that the
26 present uncertainties and turmoil generated
27 by environmentalists, ethnic groups, and
28 international interests so clouds the issue
29 that it is quite impossible to be sincere and
30 objective in drafting a brief at this time.

R. McRobb

We would therefore welcome an opportunity to submit a brief at a later date when more factual information is made available from which to prepare a meaningful submission. One thing we feel certain, that it would be chaotic and extremely detrimental to any interest to rush construction over a short period of time. We feel that a minimum of five years or longer should be considered in order to minimize the boom and bust effect and give some stability to the economy of the north.

In this vein we also feel that government must have a strong say in preventing runaway labor agreements which contribute to the boom and bust situation, as is apparently happening in Alaska at present.

In the meantime, this Association will endeavor to study the effects of the Trans-Alaska Pipeline on the transportation industry in Alaska so that we may learn and benefit from their experiences.

I would appreciate being advised whether this opportunity will be made available to the Association at a later date, and if so, just to whom it should be directed."

THE COMMISSIONER: Thank you very much, sir. I think the questions you have raised are well worth your pursuing in a brief with the members of the Association, and we would be happy to hear from

R. McRobb

1 you again, either by having you send us a brief or
2 appearing in person, if you wish. I think after this
3 week we will not be coming to Whitehorse again, but we
4 will be in Yellowknife for some time to come. What
5 you can do is simply leave your name with Mr. Waddell
6 and so that we know who you are and we can stay in
7 touch with you. You can reach us by simply writing to
8 me at the Resources Building, Yellowknife. That's the
9 only address you need, and your submission will reach
10 me, and I will look forward to hearing from you and to
11 reading what you have to say.

12 I think that's all I can say at
13 this stage, and just leave it to you and your colleagues
14 to put down your views in writing when you've had a
15 chance to give the matter further consideration. In
16 the meantime if you wouldn't mind letting us have
17 your written statement, you did deal with some points
18 of substance there, and we could retain that and it
19 could be marked as an exhibit and form part of the
20 record of the proceedings.

21 A Thank you, Mr. Berger.
22 There's one more point. Since the hearing started
23 our colleagues in the Association have got together and
24 one thing that bothered the group as a whole was the
25 fact that the gas seems to be -- the idea seems to be
26 to pipe this gas out of the north by the shortest
27 possible route and I'm kind of appalled by the fact
28 that I notice that Fairbanks is not going to get any
29 gas, Anchorage, no gas, no gas for Whitehorse by the
30 prime route, no gas for Dawson, Mayo, and I find it

R. McRobb

1 hard to believe that citizens of the north are going
2 to benefit by selling this valuable fuel that we've
3 got to ship in here 2,000 miles right now, and not have
4 any of it, and it was a concern of our group that it
5 may as well stay in the ground. You know, we're not
6 getting any benefit from it at all.

7 THE COMMISSIONER: Well, if
8 you want to ask any questions of the representatives
9 of the pipeline companies, they are here tonight at
10 my invitation, not just to hear what you have to say.
11 I think they should, but if you want to ask them any
12 questions about that, feel free. I'll call them forward
and ask them to discuss the very point you've raised,
14 if you wish.

15 A I would appreciate it,
16 because in the Commissioner's address yesterday he made
17 a statement that I think almost every Yukoner would
18 agree with, that Yukoners must benefit by this project,
19 and about the only way I feel that the Yukoners will
20 benefit is we all pay a high cost for heating right
21 now, we have been for years, and there's got to be
22 gas, you know, available to the Territory, and if it's
23 all going south, you know, down across the line somewhere
24 or eastern Canada, it's just going to be, I think, too
25 bad.

26 THE COMMISSIONER: Mr. Carter
27 and Mr. Hollingworth, if you would like to, each of
28 you to designate one of your people to just come over
29 here and say a word or two about the questions that
30 have been raised.

R. McRobb

MR. HOLLINGWORTH: Thank you, Mr. Commissioner. Mr. Hushion, the executive vice-president of Foothills Pipe Lines is here this evening. Hewas sworn and testified in Hay River and he will speak to this matter.

THE COMMISSIONER: All right,
and Mr. Carter?

MR. CARTER: Mr. Workman.

THE COMMISSIONER: All right, perhaps Mr. Hushion and Mr. Workman will come over here and just address themselves to the question that this gentleman has raised.

What's your position with the
company, Mr. Workman?

MR. WORKMAN: I'm manager of Northern Affairs for Canadian Arctic Gas.

THE COM MISSIONER: Right. Well, you two gentlemen decide who is going first. I think I should tell you that there are two companies that want to build the pipeline. One of them, Arctic Gas, whom Mr. Workman represents. Mr. Workman is the gentleman in the tan, very smart tan outfit. They want to bring gas from Prudhoe Bay along the Arctic Coast of Alaska and then along the Arctic Coast of the Yukon and down the Mackenzie Valley.

Mr. Hushion, who is the vice-president of Foothills, represents a company, Foothills, that doesn't want to bring Alaskan gas into Canada but simply wants to take the gas from the Mackenzie Delta south along the Mackenzie Valley to connect with

R. McRobb

1 the Alberta system. Those are the two proposals, and
2 that's why I asked these two gentlemen to step forward.
3 So --

4 MR. WORKMAN: As Justice Berger
5 has said, Canadian Arctic Gas is interested in bringing
6 the Alaskan gas, the U.S. gas from Alaska down to the
7 U.S. market, and the delta gas into the Canadian market.
8 Now there is a choice of routes, I guess, that we can
9 take to bring this gas to market. Naturally we would
10 prefer to bring it down the most economical way and
11 we looked at various alternate routes to do that and
12 tried to choose the route that is most economical and
13 will do the least damage to the environment. In other
14 words, we want to find the best route to bring the
15 gas to market.

16 Now, after much study we have
17 found that what we call our prime route, what we
18 consider the best route to bring it down, is across
19 the North Slope of Alaska, North Slope of the Yukon
20 to the Mackenzie Valley, then down the Mackenzie Valley
21 into Alberta, where it splits east and west. In so
22 doing, of course, we miss the market area of Whitehorse,
23 Dawson City, and so on. We do bring it close to the
24 market areas of the communities in the Mackenzie Valley
25 in going that way. Unfortunately, I guess, those
26 communities in the Yukon miss this opportunity to use
27 gas. If we were to bring the gas down, say, through
28 the Yukon, then we'd have to say to the Mackenzie
29 communities, "Unfortunately, they have missed it."

30 They are in a position where

R. McRobb

1 they will be close to the pipeline and the Yukon
2 communities will not be. It's just not economical,
3 there's no way you can bring a line over several hundred
4 miles to serve a small community. The cost of the fuel
5 would be just unreasonable in such a situation. So
6 for you people in the Yukon, there's just no way you
7 can say, utilize the gas that is going, say, down the
8 Mackenzie Valley. It's just too far from the line to
9 bring a side line into these communities; and likewise
10 if it happened to go this way, it would be too far to
11 take it into the Mackenzie Valley.

12 A Thank you. I was just
13 looking at your prime route, though, and what we
14 couldn't understand is follow the prime route and then
15 run a line -- this isn't even an alternative on this
16 plan, but we couldn't understand why the prime route
17 couldn't be followed, and then if you're interested
18 in not disturbing the environment, why didn't you run
19 the pipeline down the Dempster? You know, you've al-
20 ready got a road there anyway, and --

21 MR. WORKMAN: To follow the
22 Dempster?

23 A Yeah, just run it down
24 the Dempster, follow your prime route out of Prudhoe
25 Bay, and then down the Dempster Highway from the high
26 Arctic, and run it down that way. You already have
27 one -- it's a combination of two lines that you've
28 got here. I know it might be a mind-boggling question
29 to ask at this time, but that seemed to be the natural
30 way of doing it. Then also in your answer there you

R. McRobb

1 said, "Well, it's not feasible to bring the gas to
2 Whitehorse." I realize this, but to make the whole
3 project feasible seems to me that as part of the cost
4 of the overall project, the people in the north must
5 have some of this gas, and it's going to have to be
6 added on, you know when we were bringing in oil, just
like Alaska in the good old days when they had to bring
their oil up from Texas and it cost them a
lot of money. Now it's reversed, it's going to cost
the people down in Texas a lot of money because they've
used all their oil, and as far as I'm concerned I've
been a resident here for 13 years which makes me a little
bit of an old-timer. Many people have been here longer
than me, but there's no way the people of the Yukon
are going to benefit.

Now I don't care if they give
the money to the Federal Government and say, "Here,
we're all getting a nice royalty on this, I'll tell you
right now the cost of living will be as high for me
as it's always been."

Now they just raised the cost
of gasoline across Canada, it's going up to \$1. a gal-
lon, you know, and listen to them howl down there. But
we've been paying it for years, and up here we may be
Canadians but I'm a Yukoner first, to heck with the
rest of Canada right now. We're not here to service
all Canada, we're here for the people in the north, and
if they don't want to pay the price for the gas down
there because it costs extra to service the north,
then I guess our gas is just a little bit too high for

R. McRobb

1 them right now and they're going to have to wait a
2 few years until the price gets jacked up a little bit.
3 So you know, I'm just trying to answer your question
4 and give my thinking, and that's my thinking, you know.
5 If it's going to cost an extra \$2 billion to do it this
6 way, he's got ^{hundred} 45/million cubic feet a day going
7 through there and just figure out what the two billion
8 is going to pump onto the freight of a thousand cubic
9 foot of gas. Now all I know about gas is I remember
10 about three years ago there was a commercial on T.V.
11 and there was a guy who came out and was -- he had
12 a '56 Chev in front of him and he says, "Come on back
13 to the good old days." Remember that commercial?

14 '56 prices, and he was advertising for a gas company
15 across the border in B.C. and the Pacific Northwest
16 area, and they were still selling gas down there for
17 good old '56 prices. Finally they discovered that this
18 natural gas was being sold much too cheap and the price
19 has gone sky high from that, and I think it's a very
20 valuable commodity, and we're heating our homes here
21 with fuel that has to be shipped up all the way from
22 presently Vancouver, or trucked in from Haines, and
23 where it comes from there I don't know.

24 But Yukoners must benefit, and
25 sir, I would love to hear you tell me how Yukoners is
26 going to benefit from this if the prime route pipeline.
27 We are not going to benefit.

28 MR. WORKMAN: Well, it's a
29 difficult choice. You say Yukoners must benefit. We've
30 heard when we were in the Mackenzie Valley, that the
31 people living in the Mackenzie Valley must benefit.

R. McRobb

1 You know, we can't build pipelines through every
2 community in the north.

3 THE COMMISSIONER: Well, I
4 think Foothills deserves equal time, Mr. Workman, so
5 Mr. Hushion, we'll hear from you.

6 MR. HUSHION: I'd like to say
7 that you know, Foothills, of course, is looking at
8 moving the Mackenzie Valley gas in a direct route
9 to Canadian markets, and I think one of the issues that
10 has been brought up by you, sir, is that we have
11 already taken what we would say leadership in providing
12 gas to the communities in the Mackenzie Valley, and
13 some of the ones that are further off the line, realiz-
14 ing, I think, that this is something that must be
15 adhered to as far as the desires of the people of the
16 north are concerned. Perhaps you might say that this
17 is one of the costs that must be considered, perhaps, in
18 doing business in the north.

19 Now we also have suggested
20 that we can't recommend too much, but we are suggesting
21 that these other alternate routes should be looked at,
22 that is moving the Prudhoe Bay gas, the American gas,
23 as we would say, across Alaska. The people in Alaska
24 have the same considerations that you in the Yukon are
25 talking about now, that gas should be provided to
26 Fairbanks.

27 Now it wouldn't be too
28 difficult to go ahead and to move the gas across
29 Alaska as far as Fairbanks and then down the highway,
30 which has already been environmentally disrupted, we

R. McRobb

1 would say, and this is a corridor that might take a
2 pipeline without undue changes in the environment and
3 the sociological effects of things like that. At
4 the same time it would bring gas to more communities
5 in Alaska, in the Yukon, and as far as Foothills is
6 concerned, by our own route that we're suggesting, it
7 would be able to serve the people through the Mackenzie
8 Valley in that area. We think that what really needs
9 to be done, there is a lot of talk about the costs
10 being more, and they may be but we don't think so.
11 I think that further study needs to be done to really
12 decide whether these costs are factual or whether
13 they've been done without perhaps the detail in these
14 cost studies as may have been done, say in the routes
15 that are going presently through the Mackenzie Valley.

16 THE COMMISSIONER: I might
17 just add, sir, that because the question you raised is
18 one that the Inquiry is examining right now, the
19 original proposal of Arctic Gas was to bring that
20 American gas from Prudhoe Bay across the Arctic coast
21 to the Mackenzie Valley and then down the Mackenzie
22 Valley. The Mackenzie Delta gas would, of course,
23 be brought down by the same trunk line along the
24 Mackenzie Valley. What we're doing in Whitehorse this
25 week is looking at other routes, including the route
26 that you have discussed, which is the Fairbanks route.
27 That is bringing the American gas down to Fairbanks
28 and then along the Alaska Highway to B.C. and Alberta,
29 and into Southern Canada and the United States.

30 Mr. Hushion's company, Foothills

R. McRobb

1 isn't, certainly at the moment, they're not interested
2 in American gas. They say, "We don't want anything
3 to do with Prudhoe Bay gas, but we'll take the Mac-
4 kenzie Delta gas along the Mackenzie Valley and connect
5 it to the Alberta system, and then it can go through
6 the Alberta system into the TransCanada system."

7 Mr. Hushion's company has
8 said to the Inquiry hearings in the Mackenzie Valley
9 that they would be prepared to supply gas to the
10 communities in the Mackenzie Valley, at rates that
11 they claim would be less than they are paying -- less
12 than they would be paying for fuel oil at the time
13 the gas comes on-stream.

14 Mr. Workman's company, Arctic
15 Gas, has taken a slightly different position. They
16 said that if that is the condition under which the
17 line is to be built, they will supply gas to the
18 communities, too.

19 Is that pretty well what you
20 gentlemen have said?

21 So thank you very much. Those
22 were some very good points, and we'll hear from you
23 again, I understand, by mail or you will be in touch
24 with us in one way or another.

25 A Yes, we will be. Thank you
26 kindly.

27 (WITNESS ASIDE)

28 THE COMMISSIONER: Well, anyone
29 else who wishes to make a statement might come forward.

30 (SUBMISSION BY RON McROBB MARKED EXHIBIT C-175)

VISCO VINCENT JUTRONICH, sworn:

Originally I had not planned to present a brief to the Commission. However, after listening to the presentations on first day, it was obvious that it would be wrong not to speak up.

Yesterday I was very disappointed with the presentation of the facts by the panel representing one company, and I feel that considering the momentous time they have already worked on this project and the age of the computer that they could have been more specific with their presentation. I sincerely hope that the other company takes note of this commentary in presenting their projects.

Mr. Justice Berger, I've tried to evaluate some of the facts affecting the decision that has to be made, and I feel that your recommendations will play a very important part in this process. You

V.V. Jutronich

1 will have to evaluate the objectives of every single
2 group and it's very obvious that your decision will
3 not keep everybody happy. I feel that you realize that
4 the majority of opinion has not yet surfaced and
5 we should make an effort to get this.

6 Today we are living in an ever-
7 changing world of supply and demand and it is very
8 obvious that, with the present and anticipated demand
9 from the south the availability of gas in the north,
10 no matter what any single group thinks, this gas will
11 be moved. It is my opinion that these companies have
12 evaluated all methods of transportation, and outside
13 of any political considerations that the movement by pipe will
14 be the most effective.

15 Mr. Justice Berger, morally we
16 have to support the cheapest and most effective method
17 of moving this gas from the fields to the point of
18 demand. In your investigations, I recommend that you
19 visit Ontario or the central United States to determine
20 the effects of these zones being without gas for any
21 period of time, especially in the middle of winter.

22 In the same breath, I also
23 recommend that you ensure that these companies keep
24 our economic well-being in mind when they build the
25 pipelines, and that they ensure that as many people as
26 possible to benefit by the scheme. It is obvious that

27 we support the building of this line, and from pre-
28 sent known facts it appears that the prime route is
29 the one that has to be recommended, these companies have
30 to realize that they will also have to provide a service

V.V. Jutronich

1 to us, which is competitive.

2 Yesterday you spoke of alter-
3 native routes and loop lines. I recommend that if
4 the prime route is selected, then these companies will
5 have to evaluate the requirements for feeder lines which
6 will have to be paid for by the overall scheme. In
7 other words, we have to develop the north, and it's
8 feasible to say that the south will pay. To support
9 our argument it must be realized that there is a trade-
10 off and that we will feel the effects both economically
11 as well as socially, and the ultimate cost to us as
12 individuals living in the north could be very, very
13 high. Our industry anticipates certain problems in
14 the initial stages, but these will be offset by the
15 ultimate availability of cheaper heat and power, which
16 will allow us to mine lower grades of ore, resulting
17 in a more competitive consumer price.

18 In addition, it allows us to
19 take full advantage of the resources of the Territories.
20 This scheme is, as already suggested, one of the
21 technical greats. In my opinion, a comparison could
22 be made with another great and that is the building
23 of the Alaska Highway. This route has assisted in the
24 development of the north, and if we interviewed persons
25 living along this route in this Territory or even
26 Alaska, we will then evaluate the benefits.

27 This great -- and I mean the
28 Alaska Highway -- has tremendous impact on the north.
29 It has affected and continues to affect the environ-
30 ment. In my opinion, there has been a partial recovery

V.V. Jutronich

1 and when considering the service that this project
2 has given to us, and will continue to give us, then I
3 feel the price is small.

4 Today, especially when we
5 consider the paving of the road, we do not stop to
6 consider the effort that was applied in the 1940's.
7 Our governments, both Federal and Territorial, will have
8 to make other decisions, like speeding up the construction
9 of the Skagway Road, completing the Dempster, building
10 hydro-dams, etc. Things are changing and we will have
11 to keep pace with them.

12 Mr. Justice Berger, you have
13 already listened to the experts on environment, and
14 however directed, you will have to evaluate their
15 objectives when making your decision. You will realize
16 that technology has not kept pace with requirements,
17 and you will have to evaluate the costs and effects of
18 trade-offs which may be very difficult, and you have
19 my sympathy in making some of your decisions, working
20 in an industry which today is often under public scrutiny
21 there are many things which can be done to reduce the
22 effect on the environment.

23 At our mine we are planting
24 grass in an area where we have a water line. For three
25 years practically nothing grew. Today we would like
26 you to come and see the results because we have a
27 certain amount of grass growing there.

28 To conclude, Mr. Justice
29 Berger, it is proposed that we support the most efficient
30 system which will benefit all consumers. It is

V.V. Jutronich

recommended that consideration be given to ensuring that benefits to the north are on-going, and do not cease when construction ceases. To us the price is high, but it will be compensated for by the rewards. With suitable controls it is felt that all sections can and should benefit.

I would also like to quote
John Dunn:

"No man is an island entire of himself.
Every man is a piece of the continent,
a part of the main. If a clod be washed
away by the sea, Europe is the less as well
as if the promontory were, as well as
if a manner of thy friend or thine own were. Any
man's death diminishes me because I am
involved in mankind, and therefore never
send a note for whom the bell tolls,
It tolls for thee."

THE COMMISSIONER: Thank you
very much, sir, for a most thoughtful presentation.
Would you let us keep that and it will be marked as
an exhibit and form a part of the permanent record of
the proceedings?

(SUBMISSION OF V.V. JUTRONICH MARKED EXHIBIT C-176)

THE COMMISSIONER: I think I
should say, because the last witness and you, sir, have
dealt with the question, that the question of gas be-
ing supplied from the trunk line to the communities
in the north has come up any number of times. You

V.V. Jutronich

1 would expect that, and because I thought that would
2 arise, I made a grant of money to the Northwest
3 Territories Association of Municipalities last fall
4 to enable them to carry out a feasibility study to
5 determine whether gas could be supplied economically
6 from a trunk pipeline to the communities in the
7 Mackenzie Valley and the towns and the cities, and
8 if it couldn't be done in a competitive sense, what
9 kind of subsidy would be required, and I expect that
10 submission from the Northwest Territories Association
11 of Municipalities will be coming before me later in
12 the year. If an alternate route were eventually to
13 be chosen through the Yukon, in the way that Mr --
14 the representative of Foothills suggests, the matter
15 would have to be dealt with on its merits here in
16 the Yukon, too.

17 Is there anything you wish
18 to add?

19 A No, I think a lot of
20 our brief is more or less the same as the gentleman
21 who was in the seat before me, and he asked the ques-
22 tion of, "Who will pay for it?"

23 Sitting yesterday listening
24 to Mr. Gibbs raising questions on the alternative
25 pipe route which was to go through Fairbanks, White-
26 horse, and then down south, some figures were quoted.
27 Now, as an individual I feel that if we follow -- and
28 I feel that we should follow the cheapest and the
29 most efficient route, which appears to be the prime
30 route -- but when these companies sit down to evaluate

V.V. Jutronich

1 the systems, that they should also consider that
2 there is a greater market, and there is a possibility
3 that we will have to be subsidized.

4 Q Sorry, there is somebody
5 doing the dishes back there and I -- would you repeat
6 the last couple of sentences?

7 A O.K. There is a certain
8 amount of subsidy and you know, the questions as Mr.
9 Gibbs tried to raise as the cost of different things,
10 well to date I don't think there is enough background
11 to be able to evaluate the cost of one against the
12 other. But having a look at the cost of the prime
13 route against the Fairbanks corridor, when you talk
14 about five and seven billion against 8.1 billion, I
15 think that will pay for quite a lot of feeder systems
16 or trunk lines which will be to the benefit of the
17 smaller communities. You know, what I'm trying to
18 point out is that when they sat down originally there
19 were certain terms of reference, have they the right
20 or responsibility of changing some of these terms of
21 reference?

22 Q Well, what is happening
23 is that people like yourself and others throughout
24 the north are making submissions to me. I may or may
25 not recommend to the government that they only be
26 allowed to build the pipeline on the condition that
27 they supply gas at reasonable rates to the communities
28 in the north, within a given distance of the pipeline.
29 Then it will be up to the Government of Canada to
30 decide whether they will accept that recommendation,

V.V. Jutronich

1 and attach that condition. But the pipeline companies,
2 each of them, have simply come before the Government of
3 Canada and said, "We want to build this pipeline and
4 these are the routes we want to use."

5 The government has said, "We
6 will set up an Inquiry to look at the whole proposition
7 and hear what people in the north think, hear the
8 experts, and then let the Inquiry," that is myself,
9 "report to us and then we will decide what to do."

10 Now that means that the
11 thing can be looked at from any number of aspects.

12 A Sir, would it be possible
13 to ask if it would be one of your recommendations to
14 include a technical staff to investigate the feasibility
15 of investigating these feeder lines or alternative
16 routes?

17 Q Well, I've already --
18 let me put it this way. I don't want to hire any
19 more people than I have to, so I gave a grant to the
20 Northwest Territories Association of Municipalities and
21 I said, "You represent the people in these municipali-
22 ties along the Mackenzie River. You no doubt take
23 the position you should be supplied with gas at reason-
24 able rates from the trunk line. All right, go out and
25 get yourselves an economist and come in here and show
26 me, if you can, that it can be done on an economic
27 basis, and if it can't, show me what kind of subsidy
28 you need that ultimately would be paid by gas users
29 in Southern Canada and the U.S."

30 Now, when everybody has had a

V.V. Jutronich
R. McRobb

1 chance to look at that and argue about it, I'll then
2 have to decide what recommendation I'll make to the
3 government, but I think you can assume that you're
4 not alone among northerners in taking the position that
5 you have.

6 A Thank you.

7 THE COMMISSIONER: Thank you.

8 (WITNESS ASIDE)

9 THE COMMISSIONER: Yes sir?

10
11 RON McROBB, resumed:

12 THE WITNESS: Mr. Berger, I
13 realize I have already spoken but you said you gave a subsidy
14 to a group in the Northwest Territories to study this.
15 I was wondering, is there any possibility of a similar
16 group in Whitehorse or the Yukon possibly getting some
17 help in this regard also? In talking about subsidy
18 I'd also like to get the comment across right now, who
19 is really subsidizing who? I think we're subsidizing
20 the south, you know, by giving them our gas, so there's
21 no question of who is going to pay for it; but if
22 they want to know the facts of how much money it will
23 cost to build feeder lines, it would sure be nice
24 if we had some money.

25 THE COMMISSIONER:
Well, I think we will

26 do this one subsidy at a time. Let's see what they
27 come up with in the Northwest Territories and they
28 will be coming up with that later in the fall, and
29 if it comes out that this thing is to be built through
30 the Yukon, of course the matter would have to be

R. McRobb
F. Waller

1 examined in the same way that we are examining it in
2 the Mackenzie Valley. So you're quite entitled to
3 make that point.

4 (WITNESS ASIDE)

5 THE COMMISSIONER: Anyone else
6 who would like to say something? If we've run out
7 of local people, what I intend to do is to put that
8 infamous panel back on the stand and let the lawyers
9 keep hammering away at them. I don't know if that's
10 your idea of entertainment or not, but if it is, you're
11 welcome to remain.

12 I'll just wait a moment and
13 see if there are any more local people who would like
14 to speak. Yes sir, take a seat there and go right
15 ahead.

16
17 FRANCIS WALLER, sworn:

18 THE WITNESS: I don't know about
19 this, but --

20 THE COMMISSIONER: Would you
21 give me your name, first of all?

22 A My name is Francis Waller,
23 and I represent nobody, and I hope these are a joke.
24 It says:

25 "Union of Pipeline Blasters Yukon Local."

26 Q M-hm.

27 A And I'm presenting them
28 to you as a gift. Sometimes this gets bogged down
29 with verbage and you're quite able to break that, and
30 this is just a gift of appreciation, and I hope this

F. Waller

1 stays a joke. That's all I have to say.

2 THE COMMISSIONER: Well, thank
3 you very much.

4 A I understand your son
5 collects T-shirts, there is one for him, too.

6 (LAUGHTER & APPLAUSE)

7 THE COMMISSIONER: Thanks very
8 much. Well, I think we better -- I think we won't mark
9 that as an exhibit but we'll take it into our possession.

10 (WITNESS ASIDE)

11 THE COMMISSIONER: While any of
12 you who may still be thinking of speaking are
13 giving it a little further thought. We will ask the panel to
14 come up here again.

15 (PROCEEDINGS ADJOURNED TO AUGUST 13, 1975)
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1 Whitehorse, Y.T.

2 August 13, 1975.

3 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

4 THE COMMISSIONER: Well, ladies
5 and gentlemen, I'll call the hearing to order this
6 evening. This is our third day here in Whitehorse and
7 we have set aside time each evening to hear from anyone
8 who lives here who wishes to say anything about the
9 proposal to build a pipeline to bring gas from the
10 Arctic to Southern Canada and the United States. We've
11 heard from a number of you Monday night and Tuesday
12 night, and we will be happy to hear from any others
13 among you who wish to speak tonight.

14 We are in the middle of hear-
15 ing the evidence of some distinguished lawyers and
16 environmentalists who are discussing a proposal to es-
17 tablish a Wildlife Range in the Northern Yukon, and
18 we'll get to that if there are none of you who wish
19 to say anything, but if there are please feel free to
20 come forward to one of these tables here and just say
21 what your views are.

22 Well, I tell you what I'm
23 going to do, I'm going to invite our panel to return
24 and in the meantime if any of you decide you'd like
25 to say anything, you should feel free to bring your
26 names to the attention of Mr. Waddell -- Mr. Waddell
27 is this gentleman right here. Did you wish to say some-
28 thing, sir? Well, you just take a seat at the
29 microphone and we'll hear from you first.

30 Now that the rest of you know

A. Netherton

1 who Mr. Waddell is, later on in the evening if you
2 decide you wish to say something, just tell Mr. Waddell
3 and we'll ask you your views later.

4 Yes, we'll swear you in, sir,
5 if we may.

6 ALEX NETHERTON, sworn:

7 THE COMMISSIONER: Could we
8 have your name, sir?

9 THE WITNESS: Alex Netherton.

10 THE COMMISSIONER: Yes, sir.

11 THE WITNESS: First I should
12 say that I was very hesitant at first about speaking
13 to the Inquiry. In the first place, I don't think I
14 qualify as an insider or as a resident in many ways,
15 although I've worked many seasons in the Yukon.

16 Q Will you move that
17 microphone a little closer to you and then we'll all
18 be able to hear you.

19 A Although I've worked in
20 the Yukon since the early '70's, at first I worked
21 for International Jet Air, an airline that ran charters
22 through the Yukon and Northwest Territories, and had
23 a regular scheduled run between Whitehorse and Inuvik,
24 and I worked for those people, I guess it was six
25 or eight months. I've worked on the Dempster surveying
26 and labor jobs in town. I worked for Skukum Jim's for
27 a little while, just laboring, contract, digging up
28 foundations. I have a fairly good knowledge of the
29 Yukon, I guess, as just a person who has been working
30 here, and in the second place, I've a B.A. in political

A. Netherton

1 science. Most of my research has been done on the
2 Yukon. I'm up here to write my honors paper in two
3 areas, and one is the current political situation here
4 and the second one, which I'd like to mention tonight,
5 is on the Yukon social history.

6 I was interested in the period
7 during the depression in Dawson in the areas between
8 1930 of the mid-'30's, the war, the road, and then
9 after the road. I really didn't think I was qualified
10 to say anything, but after I heard these proposals
11 tonight I think that perhaps some things should be
12 pointed out.

13 The first thing, the road was
14 the first big project development in the Territories,
15 and it was not a split decision, as many people may
16 believe now. It was -- there was an International
17 Highway Commission set up in 1938, there had been many
18 Commissions before that and many hearings. Similar
19 to this hearing here, they went to various communities
20 along the proposed routes and heard evidence. The
21 Americans, first it was a Representative Magnusson
22 from Seattle, wanted a road to go along the coast
23 of B.C., along the panhandle, and just whip through
24 the Yukon Territory by Whitehorse to get along -- to
25 get around the St. Elias Mts and then go onto Alaska.

26 The Canadian Government wanted
27 a road to go from Alberta up the Peel and Liard Valleys
28 to Dawson and at this time in the Yukon Territory,
29 which is in a sense similar to the delta area, there
30 were less than 4,000 people who stayed the winter, and

A. Netherton

1 it was entirely connected by water and air. One of
2 the interesting things is, well, of course those
3 two similarities first in the two proposals I'd just
4 like to discuss.

5 In the first place the Arctic
6 Gas proposal is similar to Senator Magnusson's proposal,
7 in my eyes, in the first place tapping along the
8 -- connecting with the North Slope oil fields to
9 export gas going down the delta to me in a sense is
10 a project that is designed to meet American needs, as
11 was the first highway project; and although they say
12 perhaps they don't want to export Canadian oil, I
13 can't help but believe it will be exported. As far
14 as I'm concerned, when you export Canadian energy
15 you're exporting Canadian jobs. That is a well-
16 founded economic argument.

17 The second proposal, that
18 of Alberta Trunk, the all-Canadian line, seems to have
19 a great many advantages, and those advantages come
20 along the community service that they apparently are
21 going to perform, to selected Northwest Territories
22 communities. By that I mean the pipes of gas going
23 into the communities. But I suggest that that's only
24 a very small difference in a lot of ways because the
25 impact is going to be a lot greater than the cost of
26 gas to these communities.

27 In the Yukon during the war
28 a basic similarity to both proposals on this Commis-
29 sion, I feel, is the short construction time. Both
30 timetables are for a two or three-year construction

A. Netherton

1 period, which I think is very similar to the highway
2 construction here, and I think the costs, which were
3 terrific in the Yukon, socially with the amount of
4 people who moved and were not given any economic
5 livelihood, with the type of people who were brought
6 into the Territory who had no experience in the north
7 before, and we heard from the magistrate today who
8 said the implications of that are pretty fantastic.
9 Even along racial lines, Southern Canadians have
10 no idea what the north is like, they have no idea of
11 living with two people, peoples with different ways
12 of life.

13 I think that it would essen-
14 tially change the Mackenzie Delta area and make it
15 almost a similar situation to Whitehorse today, but
16 historically speaking, during the boom of the construc-
17 tion in the Alaska Highway there was such a shortage
18 of manpower in the rest of the Territory that all
19 capital projects had to be shut down until after the
20 war, and the Territorial Government had to bank funds
21 that were allocated, that is all capital works projects,
22 all civil projects in other communities, and I think
23 very much of the same things will happen in the
24 Northwest Territories when they start to build that
25 pipeline in a two-year schedule. You will find areas
26 of very heightened activity and it will be at the
27 expense of other areas, and all this for the sake of
28 a two-year construction.

29 Any effects, I think, are
30 long-range, and the damage, I think, is long-range.

A. Netherton

1 As is very evident in the Yukon today, the basic
2 similarity, I think, is astounding. If you look at
3 Whitehorse, if a person is to measure the impact of
4 this type of development a study should be done of
5 Whitehorse because it is a direct descendant of the same
6 type of quick construction, quick project, and I would
7 think that a basic sociological study of this city would
8 show that it is not really a city, it's an area of five
9 or six distinct settlements.

10 I think from the absence of
11 local representation at this hearing, you will find
12 that they are not politically interested; but I wouldn't
13 take that lack of political interest as a sign of
14 contentment. I think they are so fed up with the type
15 of handling they've had by government and by government
16 projects and by government schemes that the Inquiry is
17 essentially meaningless to the people of Whitehorse.

18 I think that it would be just
19 a very good thing to do, to do a socio-economic
20 study of Whitehorse to look at impact, because I
21 think it is the type of evidence you are looking for,
22 all the questions during the questions directed to the
23 Arctic Gas Board were, "What sort of guarantees?"
24 "What will happen?" And of course they couldn't say
25 exactly. I think there's much evidence, much is to
26 be learned from just looking at Whitehorse.

27 That's about all I have to
28 say.

29 THE COMMISSIONER: Thank you
30 very much, Mr. Netherton. I appreciate your coming

A. Netherton
Mrs. O. Posiwaschek

1 forward. I can't promise you a study will be done
2 of Whitehorse, but I will ask Mr. Weick, who is an
3 econimist on my staff, to consider the matter and
4 let me know what he thinks of it. There may have been
5 a study done. Or would you know of it if there had
6 been one done?

7 A I don't know of a
8 direct related study that would be geared to this type
9 of thing. I think one of the major points to look at
10 and one of the weaknesses I found in just looking at
11 the Arctic Gas panel is there are so many social
12 costs that are not directly economically determined.
13 There can even be -- they are very long-range and they
14 can be to the extent of, what type of people are going
15 to come and work on the pipeline, similar to the
16 Americans building the road and similar to the Alaska
17 experience now, the Arctic Gas says the camps will be
18 in and out of Edmonton. They would work eight weeks
19 and fly in and out of Edmonton and that exactly
20 doesn't work, I don't think you can do that to people.
21 You can end up with a situation as there is in Alaska.

22 Q Thank you very much.

23 A You're welcome.

24 (WITNESS ASIDE)

25
26 MRS. OLIVE POSIWASCHEK, sworn:

27 THE WITNESS: Mr. Justice
28 Berger, my name is Olive Posiwaschek and I'm an alder-
29 man of this city, and the aspect of the Pipeline Inquiry
30 in which I'm interested is what it will do to the

Mrs. O. Posiwaschek

1 development of Whitehorse, and I think this carries on
2 very well from what our previous speaker was talking
3 about.

4 The people of Whitehorse, I
5 think, changed their attitude very noticeably in the
6 last few years and it isn't very long since people
7 coming here reckoned they were going to be here for
8 two years, three years, and then they would be getting
9 out. But now there is a much greater group of very
10 settled people who feel themselves to be Yukoners, and
11 they are very definitely interested in what happens
12 to their city.

13 Now, with the city we notice
14 this in the number of people who are interested in
15 city planning and what goes on in the city, and they
16 are quite vocal, and this has been quite evident lately,
17 and people are stating what they want for this city and
18 they are also quite vocal about the reasons they have
19 come to the north, and the reason they have left the
20 big cities to the south is because they want to enter
21 a smaller community where the feeling is much more
22 personal, where you know what your neighbor does,
23 where you care what goes on in your city, and this is
24 the sort of life pattern they want.

25 I think at this stage there
26 are many people who are quite prepared to get up and
27 to say this, so that what I would like to state tonight
28 is what I think we as Whitehorse people would want if
29 the pipeline is to come through this area of the Yukon
30 and affect our city.

Mrs. O. Posiwaschek

1 I think at this point we
2 should be very prepared to learn from the experience
3 of the Alaskans. Now many of us, I think, have talked
4 to Alaskans recently who are very unhappy with what
5 has happened to their life-style in Alaska. Small
6 cities which were pleasant to live in have just
7 become huge sprawling suburbs with houses dotted from
8 one edge of the horizon to the other, and these people
9 are very unhappy about it. A thing that I should
10 like to see is that we do send people to Alaska who are
11 competent to sort of bring back statistics so that
12 they can be used in the planning of any type of
13 pipeline that crosses through this part of Northern
14 Canada.

15 It would seem to me that the
16 crucial point is the lapse between the decision of the
17 routing of the pipeline and the commencement of the
18 actual building of the pipeline. This, it seems to me,
19 is what will really interest the people of Whitehorse,
20 because in the -- in this Territory the developments
21 of land has been very slow and very difficult, and if
22 you've been involved in local government you know how
23 very difficult it is to get a land assembly completed
24 and then land and lots, you know, onto the market, and
25 we are at the stage of our development now where
26 we have a city planner. We have a very good Planning
27 Board, and we have people who are willing to make the
28 input, give it the time, and we would like, if plans
29 are made, for them to be good plans that will serve
30 this community well over the years.

Mrs. O. Posiwaschek

1 As perhaps you already know,
2 Whitehorse has no reason whatsoever to be thankful to
3 the senior governments for the way in which this commun-
4 ity has come into being. We are, as our previous
5 speaker said, we are a series of very small communities
6 which we are now trying to tie together in the form of
7 a city, and it's a very difficult and it's a very
8 expensive process. It's something that's going to take
9 years and years to do, and my own feeling is that if
10 there is going to be a pipeline and we're going to
11 have a big boom, well then presumably we're going to
12 acquire a lot of short-term accommodation so that areas
13 will be developed in a very quick fashion. What I
14 should like to see is that our city planner and our
15 Planning Board are involved in this and that these
16 people can make the input so that the areas are
17 developed in sort of neighborhood patterns and that
18 when the pipeline people leave, then these short-term
19 areas can then be used for proper housing projects,
20 something that will be attractive, not just so that
21 we leave huge scars in the whole area around Whitehorse,
22 which would be very ugly, and as you know, the rate of
23 recovery of an area in this Territory is very, very
24 slow indeed.

25 I think that the main thing
26 also that worries me is that if the government is
27 slow in its planning process, is slow to release land,
28 what will happen in a situation like this is that the
29 pressure will build up from the pipeline companies
30 and that they will come with their cats and they

Mrs. O. Posiwaschek

1 will slash out trailer camps or whatever it is that
2 is needed, and we shall be left with a mess for years
3 and years to come. I think that any Whitehorse person
4 is probably very concerned about this sort of situation
5 at this point. Obviously we don't know just how the
6 plans will go, but these are the sort of thoughts that
7 are in our minds.

8 We would like our city to
9 remain beautiful, even though we do realize that it
10 will increase in size. Thank you very much.

11 Q Thank you, ma'am. I
12 think I should tell you that we are trying to learn
13 insofar as we can from what is happening in Alaska now,
14 and one of the participants in this Inquiry, Canadian
15 Arctic Resources Committee, called as a witness this
16 afternoon Magistrate Sprecker from Glennallen, that's
17 a small community in Alaska on the route of the pipe-
18 line, and he discussed for an hour or two this after-
19 noon with us the impact it had had on crime and on
20 the community itself, and tomorrow I've been told that
21 we will be hearing from some other Alaskans who have
22 come over to speak at the Inquiry. They will be
23 heard from in the daytime, but I think I should tell
24 you we are anxious to learn all we can, and you said
25 "competent people should go to Alaska," I went myself
26 two months ago, which may -- well, to learn what I
27 could, and so the suggestion you make is one that I
28 think is well worth pursuing and we are trying to.

29 Thank you for your submission.

30 A Thank you.

Mrs. P. Delaney

(WITNESS ASIDE)

THE COMMISSIONER: Yes ma'am?

MRS. PAT DELANEY, sworn:

THE WITNESS: My name is

Pat Delaney. I represent the other 20% of the natives in the Yukon that Commissioner Smith failed to mention. The Yukon Association of Non-Status Indians. What I have, Mr. Berger, is a letter of support of the Council for Yukon Indians brief, and I'd like to read it.

THE COMMISSIONER: Please do.

A Dear Mr. Berger, The Yukon Association of Non-Status Indians agrees with and fully supports the brief of the Council for Yukon Indians. We do not therefore intend to submit a comprehensive brief, but we will make a few comments in this letter which we want included in the record of the Inquiry.

Our unpleasant experiences in the past with the dominant society's reckless rush to take wealth from the land causes us to be cautious. Surely no one can fault us for insisting on land settlement before another huge project goes ahead. Native people do not wish to make the terrible sacrifices they have made in the past to satisfy excessive consumer demands by urban and industrial life-styles. We want to have a quality life-style, but we are convinced that we can only achieve it if we have control over our economic development through a land settlement before further large-scale developments happen in the Yukon.

We congratulate you, Mr.

Mrs. P. Delaney

Berger, on your conduct of this Inquiry and we are confident that you will ensure that our interests are properly spelled out and fairly served when you make your recommendations to the government.

Yours truly,

"BILL WEBBER"

President.

Q Thank you very much.

Will you leave that letter with us --

A Yes.

Q -- and it will be marked as an exhibit and form part of the permanent record of the Inquiry.

A Thank you.

(LETTER FROM YUKON ASSOCIATION OF NON-STATUS INDIANS MARKED EXHIBIT C-177)

(WITNESS ASIDE)

THE COMMISSIONER: Would anyone else like to speak before we reassemble this panel?

Well, we'll ask you, Mr. Anthony, to carry on with this panel and I should tell the people here from Whitehorse that if in the course of the evening you decide you do want to say something, we'll stop for coffee later and you can tell Mr. Waddell or tell me that you wish to speak, and I'll call on you after the coffee break.

(PROCEEDINGS ADJOURNED TO 10:20 P.M.)

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

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Government
Publications

MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF AN APPLICATION BY CANADIAN ARCTIC
GAS PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT
BE GRANTED ACROSS CROWN LANDS WITHIN THE YUKON
TERRITORY AND THE NORTHWEST TERRITORIES FOR THE
PURPOSE OF THE PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE
PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

March 21, 1975.

PROCEEDINGS AT INQUIRY

VOLUME XXIII

CANADIAN ARCTIC
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APPEARANCES:

Mr. Ian G. Scott, Q.C. Mr. Stephen T. Goudge, Mr. Alick Ryder and Mr. Ian Roland	for Mackenzie Valley Pipeline Enquiry;
Mr. Pierre Genest, Q.C. Mr. Jack Marshall, Mr. Darryl Carter, and Mr. John Steeves	for Canadian Arctic Gas Pipeline Limited;
Mr. Reginald Gibbs Q.C. Mr. Alan Hollingworth	for Foothills Pipelines Ltd.;
Mr. Russell Anthony, Prof. Alastair Lucas & Dr. Andrew Thompson	for Canadian Arctic Resources Committee;
Mr. Glen W. Bell and Mr. Gerry Sutton	for Northwest Territories Indian Brotherhood and Metis Association of the Northwest Territories;
Mr. John U. Bayly	for Inuit Tapirisat of Canada and the Committee for Original Peoples' Entitlement;
Mr. Ron Veale and Mr. Allan Luke	for Yukon Native Brother- hood;
Mr. Carson H. Templeton	for Environment Protection Board;
Mr. David Reesor	for Northwest Territories Association of Municipal- ities
Mr. Murray Sigler	Northwest Territories Chamber of Commerce

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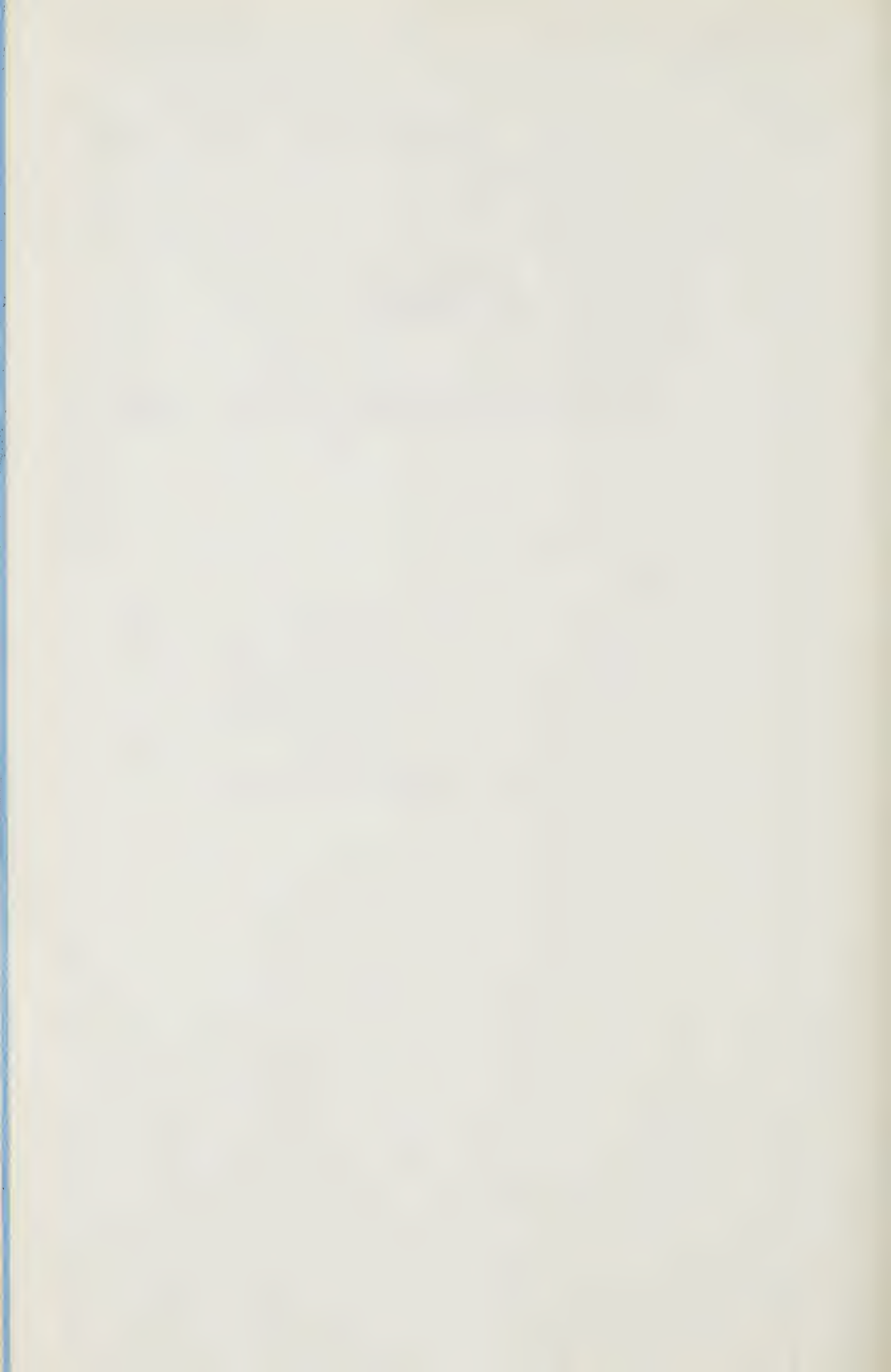
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Garry Wood HOLLINGSHEAD	
Edward Charles McROBERTS	
William Alexander SLUSARCHUK	
Norman Reuben MORGENSTERN	
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Yellowknife, N.W.T.

March 21, 1975.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. SCOTT: Mr. Commissioner, Mr. Anthony, I think, wants to file a document that was referred to yesterday.

MR. ANTHONY: Mr. Commissioner, yesterday it is found in the transcript, page 2643 I referred to the study entitled:

"1974 River Breakup & Ice Study," by Blench & Associates. It was described in detail there but it was not officially filed as an exhibit and I would like to do so now, as I believe, Exhibit 82.

)1974 RIVER BREAKUP & ICE STUDY MARKED EXHIBIT 82)

MR. GENEST: Mr. Commissioner, along with a tuba and a trumpet, we received some alignment sheets yesterday in reference to the cross-delta route, and I have left a copy with the secretary. I wonder if they might be filed--

THE COMMISSIONER: Yes.

MR. GENEST: -- as the next exhibit?

(ALIGNMENT SHEETS RE CROSS-COUNTRY ROUTE MARKED EXHIBIT 83)

MR. GENEST: I have also received, sir, the minutes of the two meetings, one held during the week of April 10, 1973 and another document entitled: "Draft Minutes of an Engineering Environmental Review, May 24, 1973," the production of which Mr. Scott had called for during



1 his cross-examination of the first panel. Is it the
2 desire of the Commission, sir, that I should file them
3 as exhibits?

4 THE COMMISSIONER: Yes please,
5 if you would.

6 MR. GENEST: And I've given a
7 copy to the secretary.

8 (MINUTES OF MEETING, APRIL 10, 1973 MARKED
9 EXHIBIT 84-A)

10 (MINUTES OF MEETING, MAY 24, 1973 MARKED EXHIBIT
11 84-B)

12 MR. GENEST: I have along
13 with this, sir, a very bulky and rather primitive
14 looking transcript or an attempt at a transcript of
15 the verbatim discussions that took these. My sugges-
16 tion would be if it meets . . . favor, that my friends
17 look at it and see if they want to file it, if they
18 would like it filed. It's a very voluminous and sort
19 of primitive transcript, there are many words missing
20 and so on. If my friends want to inspect it, and
21 file it later I have no objection.

22 MR. SCOTT: I suggest it be
23 filed, Mr. Commissioner, and then it can be inspected
24 by everybody at the Commission Office. It will at least
25 be a convenient place to see it.

26 THE COMMISSIONER: Will that
27 be satisfactory, Mr. Genest?

28 MR. GENEST: I'm in your
29 hands, sir.

30 THE COMMISSIONER: I think we'll

1 mark it then.

2 (TRANSCRIPT OF ENGINEERING ENVIRONMENTAL STUDY
3 APRIL 9-13, 1973 MARKED EXHIBIT 85)

4 MR. ANTHONY: Mr. Commissioner,
5 before we proceed may I just ask two questions of Mr.
6 Genest? The first one is with respect to these Minutes,
7 could you advise me whether the minutes were prepared
8 at the time, or whether they have been prepared as a
9 result of the request that came forward last week?

10 MR. GENEST: They were prepared
11 I believe from the transcript shortly after the meeting.
12 They weren't fabricated during this Inquiry.

13 MR. ANTHONY: The other ques-
14 tion I have is -- really comes out of a meeting of
15 counsel. Originally it was expected that the section
16 13-B, dealing with operations and maintenance, would
17 form part of the Phase 1 section of the hearing. In
18 the list we got from Mr. Waddell indicating the
19 first phase, operations and maintenance was not included
20 and I believe Mr. Genest was going to advise us by the
21 end of this week whether or not in fact the operations
22 and maintenance panel would be forthcoming at the end
23 or at what part of the Phase 1 operation?

24 MR. GENEST: I had instructions
25 on that, and with your leave, sir, I'd like to call
26 the operations and maintenance panel as the last panel
27 before our final policy panel during this phase.

28 THE COMMISSIONER: Well, you
29 can proceed on that plan then. Well, Mr. Templeton,
30 I think we're ready for you, if you're ready for us.

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams

Cross-Exam by Templeton
MR. TEMPLETON: I'm not sure.

Mr. Commissioner, I hope you'll excuse me. My inexperience -- this is my first effort at this -- although I'm in the very front row of august gentlemen, I'm not a lawyer and my questions in my own way apply to the effects on the environment, separate from the safety and integrity of the pipeline. Incidentally, none of my questions or comments apply to the cross-delta route because I didn't want to be involved in an environmental impact assessment of a project without first having a detailed project description, environmental data and some time to study it.

JOHN IVOR CLARK
GARRY WOOD HOLLINGSHEAD
EDWARD CHARLES McROBERTS
WILLIAM ALEXANDER SLUSARCHUK
NORMAN REUBEN MORGENSTERN
RICHARD H. COOPER
R.M. HARDY
GUY LESLIE WILLIAMS, resumed:

CROSS-EXAMINATION BY MR. TEMPLETON:

Q I want to address a question to Doctors Hollingshead, Cooper, Clark and Slusarchuk. Each of you expressed, I think, very well the geotechnical solutions to various problems that you recommend to the applicant. Such solutions as the berm for stabilization, and you used the Great Bear River as an example, and the work pad on the other side of the river, and then you demonstrated a gravel blanket at river crossings, and granular material for drainage and erosion controls along some of the slopes, and surcharging of the ground surface sometimes with granular material to reduce frost heave. So all of these

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Templeton

1 require some fairly considerable amounts of granular
2 material, and I was wondering if these requirements
3 had been included in the estimation of borrow, included
4 in the application?

5 WITNESS CLARK: Yes sir, my
6 understanding is that the estimate of the total quantity
7 of borrow requirement, which I believe is of the order
8 of 35 million yards, including the Alaska requirements,
9 do include these features. In many instances where
10 there has not been a site specific design, we have
11 taken a nominal figure that we think represents what
12 might be required. That particular quantity was then
13 increased arbitrarily by a 30% contingency and that
14 contingency is built into that first number that I men-
15 tioned.

1 We have, I should also
2 say that in the -- our thinking of phase I, we have
3 considered that gravel would fall into the category
4 of impact on land and the person who has had the prime
5 responsibility of assessing our requirements, locating
6 potential sources, relating these sources to access
7 and so on, is not on this panel, but I will attempt to
8 answer any further questions along that line as
9 best possible.

10 Q Well, it is very diffi-
11 cult to sometimes check those, but in your example
12 that you used on the Bear River, and I do not want to
13 go through all the computations, but would it sort
14 of in the board presentation last night it looked
15 like that you would use on one crossing of the
16 Bear River perhaps 150,000 yards as measured in
17 place. Would that be -- Maybe that is not a fair
18 question, but it is a pretty substantial amount for
19 the berm plus the work area plus the side -- going
20 up the back of the -- particularly on the North side.

21 A I do not have that
22 exact figure.

23 WITNESS HOLLINGSHEAD:

24 A If I could contribute
25 something. The temporary work berm or work pad on
26 the north side to which you refer would be built largely
27 from material excavated from the ditch across the
28 channel and then of course would be removed following
29 completion of the crossing.

30 Q You would not use gravel?

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by C.E. Templeton

1 A I -- there would be
2 very little imported material required for that
3 particular structure, if any.

4 Q How about all the material
5 going up the slopes?

6 A Much of the volume of
7 that stabilization berm would probably be random
8 material and I would think, I do not know what the
9 percentage would be. You might get an idea from the
10 cross-section of the preliminary design drawing,
11 but there is only a percentage of it that would be
12 select material rip-rap.

13 Q Now, your definintion
14 of random is local material or granular material that
15 you bring in?

16 A Well, it would probably
17 be imported from some distance at that site.

18 Q But using a loose
19 definition it is still gravel?

20 A Yes, it would have to
21 be good material.

22 Q Well the reason that
23 I brought the matter of gravel up was that, in
24 checking that one section I think you list on your
25 sheets in the, I think 240,000 yards of material for
26 that section in which the Bear River is located, under
27 the heading Borrow. There are some other things
28 for compressor stations and communications towers,
29 but it seemed to me that in the sections we looked
30 at and it is very difficult to check this, it seems

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1 to be rather underestimated and I wondered when you
2 were optimizing your designs if you are also optimi-
3 zing or you were changing the gravel qualities with
4 it.

5 WITNESS CLARK:

6 A I would think they
7 would change, but my understanding is that there is
8 a 30% contingency built into our current estimates.
9 We have not optimized, for example, a compressor station
10 which is on ground that is sloping. It is not
11 necessary for instance for the entire pad at a com-
12 pressor station to be on the same level. One could
13 terrace it at different levels for different facilit-
14 ies and actually reduce it. So I would say our thinking
15 is that in optimization that the change in numbers
16 would not be significantly upwards.

17 WITNESS WILLIAMS:

18 A Possibly, Mr. Templeton,
19 in the calculations that you made last night you might
20 indicate what percentage of the 150,000 yards or whatever
21 it was, was work pad and berm out into the river that
22 Mr. Hollingshead suggested would be taken from the
23 ditch excavation.

24 Q I do not know if I
25 can remember that. I will say that 150,000 --
26 perhaps I might have taken 25,000 or something --
27 or -- well, perhaps we could leave it but the point
28 I am making is that the Bear River is now twinned
29 so that the quantities are really doubled, are they
30 not?

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WITNESS HOLLINGSHEAD:

A No, sir, that
is not true.

Q Are you not going to
twin the BEar River?

A NO, sir.
At least the plan does not show it a dual crossing
at this time, no.

Q Well, the plan does not s
show it but I thought in the testimony you mentioned
the Bear river. Am I wrong there?

A I believe so sir.

Q Okay. So to conclude
the gravel you feel that those figures shown on
your application are applicable today using all of
the techniques that you have spelled out this week?

WITNESS CLARK:

A On the application
I believe the quantities are shown on the strip
maps. There is a greater breakdown shown in
our report, "Pipeline Related Borrow Studies",
that is listed in our documents and was produced,
I believe last fall. Now, we were also aware, at
the same time, that the Government of Canada through
the Department of INdian and NORthern Affairs,
were compiling from all the potential users,
their requirements and an estimate of the quality
of their requirements, and we provided to the
gentleman who was compiling this information, what
we saw at that time as our needs being.-- And we were

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1 hopeful to have this report actually before these
2 hearings in order that we could answer any questions
3 particularly in Phase II on the conflicts of use.

4 I am informed as recently as last night that we now
5 have this report -- a day or so ago and we will be
6 reviewing all of our requirements in light of what
7 the other people indicate as their requirements.

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For the more detailed breakdown
by section and by facility I would refer you to this
report:

"Granular related or borrow related --
Pipeline related borrow studies."

Q Who was that prepared
by?

A That was prepared by
Northern Engineering, that particular report, and it's
listed in our documents.

Q Now would you agree that
granular deposits, sir, at least on land, are a non-
renewable resource?

A Sorry, I didn't hear the
end of your sentence.

Q Are a non-renewable
resource, the gravel deposits on land.

A I would think that would
depend upon the use to which they are put. For instance,
if a gravel pit were mined and it was used for a
temporary stockpile site, it could be re-used. It's
not going to be destroyed or entered into a different
form other than that portion of its use for concrete.

Q Now I think you demon-
strated very clearly that gravel is one of your tools
of your profession, and it's spread over quite a large
area, and certainly I'm not comparing you with the
quantities, or your requirements with the quantities
required for a highway; but it still in future, for

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1
2 future generations, in fairly short supply, the same
3 as other resources, and although some places if you
4 get into a big pile you can re-use it; but if you spread
5 it over all of those features that you've showed on
6 your slides, I'm afraid you'd have a very difficult
7 time re-using it.

8 A Maybe I should clarify,
9 sir, that all of those features that we showed wouldn't
10 be granular material. In many cases we have the
11 option to do coring work in bedrock, or in other
12 cases we could use borrow material composed of say till.

13 Q And I suppose the environ-
14 mental implications of quarrying as well as removal of
15 gravel deposits.

16 A Absolutely, yes.

17 Q I'm not proposing this
18 figure, but supposing a royalty of \$1. a cubic yard of
19 gravel were to be levied, would you use the same amount
20 of granular material in the same alignment that you
21 have?

22 A Our designs are based
23 on the engineering requiremen ts and have nothing to
24 do with anticipated royalties.

25 THE COMMISSIONER: Well, would
26 you proceed on the assumption that gravel will be freely
27 available in the sense that you won't be required to
28 pay for it?

29 A No sir, not at this stage.
30 We try to develop a design that would use as little as

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1
2 necessary for several reasons, but we have not either
3 inhibited the design or we have not been excessive on
4 the assumption that it's not being paid for. I'm not
5 sure if that answers your question, Mr. Templeton, but

6 MR. TEMPLETON: It would make
7 a difference, the price you pay, you are doing it economi-
8 cally and if there was a very high price you might
9 alter some of these.

10 A Well, certainly our
11 optimization work will be carried out with a view to
12 having a more efficient design.

13 Q Dr. Slusarchuk, you
14 described the berm proposed to surcharge the ground
15 surface, and the slide that was used, I think, when
16 Mr. Anthony was cross-examining, was perhaps not --
17 it was your test site, I think, and it showed a sur-
18 charge of only perhaps a foot or something, whereas
19 actually you were talking about perhaps five feet.

20 WITNESS SLUSARCHUK: That's
21 correct, sir. On our slide the berm was probably
22 more correctly called the spoil pile, it was just that.

23 Q Well, if we get back
24 to the berm somewhere and perhaps we'll say five feet
25 for example, was the environmental impact of the
26 removal of the material to construct the berm included
27 in the impact assessment in the application?

28 A I can't answer that,
29 sir.

30 WITNESS CLARK: I wonder, sir,

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1 if you would ask that question again?

2 Q Was the environmental
3 impact caused by the removal of the material to con-
4 struct this surcharging berm included in your impact
5 assessment?

6 A I would think that in
7 what was filed it was not included. We have in this
8 report, however, to which I referred earlier, a listing
9 of all of the potential sources of borrow, and we have
10 had our environmental consultants give us an indication
11 as to whether or not they are an area of concern, and
12 that's presented there in tabular form, and as a general
13 rule, if they didn't know they would indicate that it's
14 a possible area of concern. For instance, in a quarry
15 the fish consultant would say, "There's no concern to
16 fish." But if there was any area that could be possibly
17 affect a stream, he would say, "It requires on-site
18 inspection." The same with the consultants on birds
19 and the consultants on mammals.

20 Q But is the surcharge
21 shown with the surcharge included in that?

22 A I --

23 Q The material for the
24 surcharging berm, I mean.

25 A I assume, sir, that
26 you're referring to where the material came from.

27 Q Yes.

28 A And to the best of my
29 knowledge it would be drawn from borrow areas that
30 are now designated. An exception would be if we found

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1 that a surcharge was required within an area where
2 there isn't a borrow area designated within a reasonable
3 distance, and it might involve the opening of a new
4 one. But we have not identified, on the mile by mile
5 basis, where we would surcharge because our first choice
6 is to go to deeper burial.
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1 Q While there is the
2 environmental implications of the borrow area and
3 then there are the possible environmental implications
4 haul road
of the / , I realize that if you are showing
5 these as snow roads, but weather is always a problem
6 and then there are environmental consequences after
7 you have built the berm.

8 A Yes.

9 Q And I do not see that in
10 your impact assessment.

11 A No, in the impact assess-
12 ment I think it would be fair to say there is not
13 specific attention given to a berm, because in no
14 case can we now specifically say, in this location
15 we are going to put a berm. That is part of the
16 ongoing studies. We see the berm now as a technique
17 that will inhibit frost heave.

18 Q But how do we consider
19 the impact. You say we are going to use this
20 technique, but we do not know where it is or how
21 it is going to be used, so how do you estimate
22 impact?

23 A Well, I would think
24 that it would not be greatly different from impact
25 of borrow areas that are now designated and haul
26 roads that are now designated and in so far as im-
27 pact on the right-of-way, the problems for instance
28 of cross-drainage are by and large similar to the
29 spoil mound. It is a bigger spoil mound, a wider
30 spoil mound and somewhat higher, but in many cases

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1 it would not be a great deal higher.

2 Q Well, I think a five-foot
3 high berm with stable side slopes is a fairly -- would
4 have to have a lot of weight to be of any use and it
5 has to be stable so it is a lot of material to move
6 and that causes impact.

7 A A five-foot high example
8 would be an extreme event. I think if we talked
9 about the more average case, we would be looking at
10 two and a half to three feet, ^{more commonly} /than we would with
11 five feet.

12 Q Well, it is still a
13 fairly sizeable amount of material.

14 A Yes, it would be
15 about, as Dr. Slusarchuk pointed out, 30 or so feet
16 wide. It would be a very gentle side slope, mounded
17 up and it would fit in with the overall right-of-way of
18 a 120 foot width.

19 Q Well, how do you intend
20 to handle the impact on the environment of the
21 berm itself, in other words the drainage, the longi-
22 tudinal drainage. I think you mentioned the
23 -- that you would have some cuts across the berm
24 every once in awhile to handle some of the cross-
25 drainage, but that sometimes presents problems too
26 in that it concentrates the water and possibly can
27 have downstream effects.

28 A Yes, we would have these
29 berm breaks at discreet, defined drainage courses
30 that now exist and there would be somewhat greater

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1 flow at certain periods of the year in that location.
2 The flow along the berm where we have a side slope,
3 would carry the water to these courses and then
4 redirect it through and then we would use the usual
5 techniques for instance of highway construc-
6 tion and so on of dispersing it on the down slope
7 side.

8 Q Well, that is right, but
9 you are building this in the winter and it is not
10 as easy to figure out the drainage or are you going
11 to design this ahead of time?

12 A No, the drainage, the
13 type of berm break would be designed ahead of time,
14 but the exact position where it goes would be determined
15 by the survey that precedes construction. It would be
16 marked in the summertime.

17 YOU see, if we said, put a
18 berm break at Milepost 592.467, which we picked off
19 the map, it might be better off at .468 and we cannot
20 tell that unless we get in the field and this, as
21 I am sure aware, is a common thing for, during the
22 sruvey, to mark the discreet courses, drainage
23 courses where the berm breaks will go.

24 Q And you do not antici-
25 pte problems that will require you to come back and
26 repair the downstream in case you had erosion?

27 A We would see that in
28 the first three years there would probably be a
29 fair bit of cosmetic treatment during maintenance.

30 Q This would be done in

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1 the summertime?

2 A It would be identified
3 in the summertime. As to when it was carried out would
4 depend upon the scope and severity and so on. If
5 it was the simple case of landing two men with a
6 which helicopter, /I am sure it will be in many cases,
7 that would be done in the summertime.

8 Q Would this be done by
9 helicopter?

10 A I say, if it were a
11 simple case such as a blocked berm break, clearing
12 away some debris, this could be done --

13 Q I am talking, say, of
14 erosion downstream.

15 A Yes, again, the
16 erosion can cover a wide range of severity. One
17 thing is that the cross-drainage that we are
18 talking about is generally relatively
19 flat slopes, because if the slope is steep, we do not
20 go across it. We want to go at right angles to the
21 contours so that berm breaks and erosion associated
22 with berm breaks, then do not much enter into it.
23 There we have the chevron drainage pattern which
24 can go either direction as we showed on some of
25 the slides earlier.

26 But the point you were asking,
27 sir, if I understand you, would we repair erosion
28 problems in the summer or in the winter, and I would
29 say that depends on the severity. In certain in-
30 stances one could, I would suspect, with labourers,

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1 shovels and so on and a bit of equipment, do a
2 type of treatment that would inhibit further erosion
3 and any large repairs could be done in the winter,
4 but the minor repairs I think would be done in the
5 summer. It is entirely dependent upon the type of
6 terrain and so on.

7 Q The problem that I see
8 is if you are going to -- if you have got an erosion,
9 and I am not talking what two or three
10 people could repair, but you have to use equipment,
11 how do you get in in the summertime without making
12 roads across the terrain?

13 A Well, again, here
14 we have gone through gravel, which we have seen as
15 Phase 2 and we have gone now into summer repairs
16 which we see as operation .. and maintenance, but
17

18 Q I think the problem
19 there, Dr. Clark, though is -- we all have this problem,
20 how you split a complex thing into a bunch of
21 segments -- what do we do? Wait until Mr. Horte
22 comes and ask him or -- ?
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1
2 A Could you give me a
3 specific example and I'll try to give you a specific
4 answer to it? It's very difficult to generalize. If
5 we were along the Arctic coast, we would be using quite
6 different equipment than if we're two miles out of
7 Norman Wells, so perhaps I could be more specific if
8 you could ask the question in a more specific manner.

9 Q Well, take an area, say
10 in the Travaillant Lake region, and you would have --
11 where you were on a side slope and you had a break,
12 are you going to say there aren't any slopes on
13 Travaillant Lake? I think if you knew the location
14 there is, but -- all right, if that bothers you, I'll
15 take it on the other side of the river then, on the
16 west side of the delta, where there are some slide
17 slopes, and supposing you had some erosion, and it was
18 too big for a few men to repair, what would you do?

19 A Well, first of all to
20 try to get the whole thing in perspective, we've got
21 erosion, therefore we've had a lot of running water.
22 Agreed? Now during the spring breakup the ground is
23 frozen, so it's probably not associated with the snow
24 run-off, it's then associated with a short intense
25 summer rainfall. Does that sort of set the stage?

26 Q Erosion can happen, I
27 suppose there are times when you can get erosion with
28 snow although usually you don't.

29 A Yes. Well, I think that
30 the erosion resistance is probably more when it's frozen.

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Q O.K., we'll take a summer storm.

A Well, we would have to assess the probability of the reoccurrence of that is, and our concern would first of all be, are we in danger of losing the pipeline? Secondly, what is the access, and is there a danger of further events happening that might cause excessive siltation this summer, right now? And in that case, it would be necessary perhaps to move in repair crews and equipment, and I would see in that situation, a low ground pressure vehicle or air cushion vehicle that could handle that.

Q I might put another "if" in there when you said, "Are we in danger of losing the pipeline?" I might say, "Are we in danger of damaging the terrain," as one of the hypothesis.

A I see those very closely related, sir.

Q Well, not always. Dr. Morgenstern, I think you concluded your overview with the statement that "the pipeline can be constructed in a safe and environmentally acceptable manner," I think that was part of the last sentence of your overview. Would you outline the scope of the environment considered, you know, environment is a surrounding but it depends on how far you consider the surroundings. Does it include the environment just surrounding the pipeline, or the whole biotic and abiotic environment, including birds and fish and mammals and land in its

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1 natural state and those things?

2 WITNESS MORGENSTERN: Well,
3 clearly it includes the total eco system. I think the
4 context in which you're quoting me was with regard to
5 slope stability, though I've generalized beyond that.

6 Q It's on page 2363. "This
7 concern has been addressed in a systematic manner,
8 key problems peculiar to permafrost terrain have been
9 resolved. The results of these studies have been applied
10 in the design of this pipeline so that with regard to
11 considerations of slope stability, in my view this
12 pipeline can be constructed in a safe and environmen-
13 tally acceptable manner."

14 A Yes.

15 Q But when you use the
16 'environmentally acceptable manner,' are you including
17 all of the ecosystem that you're talking -- the whole
18 ecosystem?

19 A Yes, when we evaluate
20 the degree of security, for example, of the slope along
21 a river, one of the factors that would be considered
22 in that evaluation would be the implications of land
23 slides on fish, the siltation, the sediment that
24 might occur from a slide moving into a river. In
25 the event that that was sensitive from a fish point of
26 view, that particular location, in my view a higher
27 degree of security for that slope would be needed than
28 otherwise, though of course at all times those slides
29 would occur to threaten the integrity of the pipe.

30 Q But the environment is

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1 bigger than fish because it may be affecting the drainage
2 to the wet lands and the birds and the mammals and other
3 things.

4 A Certainly, and I just
5 drew one example. I have no question that the environ-
6 mental influences of mass movements are one of the
7 controlling factors in predicating the required degree
8 of security of the slope. No doubt about it.

9 Q But you consider the
10 ecosystem around it?

11 A Yes.

12 Q Thank you. Dr. Clark, in
13 answer to a question on page 2234 of the transcript,
14 you say that "a chilled pipeline is environmentally
15 and geotechnically sound." Would you -- what is your
16 concept? Is it the same as Dr. Morgenstern's about
17 the environment, that you're considering the ecosystem?

18 WITNESS CLARK: Yes, and the
19 type of advice is based on a total ecosystem concept.
20 That's certainly my belief.

21 Q Well, you know, we've
22 had, all week there's been a great deal of technical
23 discussion on the very major efforts that your group
24 has made to maintain the integrity of the pipeline, but
25 I've heard very few references of the effects of the
26 proposed works on the natural environment. You know,
27 in all the discussions back and forth, I don't think
28 there are very many references -- and I'm not saying
29 that you should have said after every sentence there
30 is no environmental problems -- but --

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MR. GENEST: Excuse me for

interrupting, Mr. Templeton. I understand that you have a doctorate that you would rather not disclose. The reason for that, sir, Mr. Commissioner, of course is the phasing that we are prepared to come back at Phase 2 and talk about the same things and the effect of them on the land and the air and the water and the sea and the animal life, and naturally I have not directed questions to the panel in relation to the particular concerns Mr. Templeton is speaking of today.

MR. TEMPLETON: Well, I recognize the problem and it's the same problem that you have on a complex subject, but when you're talking about inter-disciplinary studies you can't always break it down into a group of disciplines, and treat one and say, "I'm not going to worry about the other because that will come later," because the other fellow when he comes later says, "I didn't do the geotechnical" and this inter-disciplinary study is a very difficult thing and I can't help, but Mr. Genest quotes you on page 2192 where you said that:

"Inter-disciplinary question is -- inter-disciplinary means that you have more than one kind of expert going along on a trip."

Dr. Clark said, "Yes sir."

Apart from the definition of "trip" -- which is facetious, I figure it requires considerably, inter-disciplinary studies means trade-offs of the various disciplines, it doesn't mean, I don't think, that one discipline is the boss and he

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1 gets a few bits of advice, I think they have to have
2 trade-offs as to what this does, and when you have this
3 route, you considered the various environmental concerns
4 and perhaps social concerns, and I really didn't hear
5 any of this. I recognize that we've broken it down into
6 segments, but you would think that that would show up
7 if there was really inter-disciplinary studies going
8 on.

9 THE COMMISSIONER: Well, you
10 carry on in your own way, Mr. Templeton, and I certainly
11 -- you have my permission to do this in your own way
12 and if it looks to Mr. Genest a little later on as if
13 he's still unhappy about it, he can bring that to my
14 attention and we will reconsider it.

15 MR. GENEST: I wasn't unhappy,
16 sir, I just was trying to alleviate Mr. Templeton's
17 own seeming unhappiness, with a lack of information on
18 the subject that interests him.

19 WITNESS CLARK: I wonder, Mr.
20 Templeton, if we could, during the discussion? I
21 lost the question.

22 MR. TEMPLETON: I hope it was
23 a question.

24 Q Well, the question -- and
25 I don't really think that you lost it, I think I didn't say
26 was that do you really feel that you're doing inter-
27 disciplinary studies and taking into account and with
28 proper weighting the environmental issues in these
29 studies and designs that you're doing, or are you
30 weighing it mostly in favor of the pipeline and then

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1 seeing if there are environmental consequences?

2 A Indeed, I do believe that
3 we really are taking an inter-disciplinary approach to
4 this design. I can give you some examples. I'm sure
5 there are many others. For example, last year we
6 had, what I would call a very detailed reconnaissance
7 of the coastal route in Alaska and on that reconnaissance
8 was Dr. Banfield, who was looking at it in a pretty
9 broad scale for us because of his many talents in that
10 area, but in particular at mammals. Dr. McCart, the
11 fish biologist, Dr. Swinesberg, the ornathologist,
12 Mr. Ray Glasrude of Northern Engineering who is a
13 wildlife biologist, engineers included Dr. Hollingshead,
14 our civil engineer Mr. Frank McLean, Dr. McRoberts,
15 myself, and we looked at every aspect that affected or
16 concerned any one of those people, and I can recall
17 one particular river crossing where, since the time that
18 we had laid out our route across that particular river,
19 and the time of our reconnaissance, a small slide had
20 developed. Well, Dr. McRoberts and I looked at it from
21 the aspect of the soil mechanics. It was a very shallow
22 slide and we felt it could be built through there but
23 it would be better to move it and by a bit of on-ground
24 reconnaissance we found a place about 500 feet away.
25 Now meanwhile Dr. Banfield was looking at the same
26 thing from his point of view, and he saw things that
27 we saw but he interpreted them in a different light.
28 He saw that because of these, your access -- for
29 instance caribou, were now using that landslide and
30 he also saw -- and this relates to other talents that

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1 he has in that field that they were using it as a
2 mineral lick; and he looked around and he picked what
3 he thought was a better crossing, and we both picked
4 the identical spot, the identical spot for different
5 reasons, and that's why I say I think that these are
6 very closely related -- the engineering aspects and
7 the concern for the environment, I think there's a
8 direct link.

9
10 There are other examples of
11 that.

12 Q I think there are many
13 examples where the phrase was used quite often, "What
14 is good for the pipeline is good for the environment,"
15 but there are also other examples such as the diversion
16 of water from downstream areas that I think I would
17 disagree with.

18 A I'm having a little
19 difficulty hearing you, sir.

20 Q Oh, sorry. Say the
21 diversion of waters from -- which may be to the
22 advantage of the pipeline, may not be to the advantage
23 of the environment. I don't think it's --

24 A I would certainly agree
25 that there are exceptions to any rule or any situation
26 that we can conceive.

27 Q I think, Dr. Clark,
28 yesterday you said regarding alternative procedures,
29 both to do it a different way -- this is page 2664,

30 "To do it a different way there would have to

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1 be an engineering or economic advantage, but
2 we haven't seen any impediment in what there
3 is now."

4 Where was the environment?

5 A Well, I can only emphasize
6 that I see these directly linked. If I say "an engineer-
7 ing advantage" I'm talking about for instance slope
8 stability, and I think slope stability is very closely
9 related to the environment. But there are also
10 examples where --

11 Q It's not related to say
12 birds very well.

13 A I would think, that from
14 my discussions in inter-disciplinary studies that the
15 bird people might take a different point of view.
16 They see situations where slope stability is distinctly
17 related to birds.

18 Q Well, I can see where
19 a stable slope is good for birds, but I don't think
20 that a curing of a problem with a pipeline is necessarily
21 advantageous to birds; if you don't do it it may cause
22 some troubles.

23 A Well, we try to look at
24 it in a total ecosystem concept, and where, if we effect
25 a riparian area, that we are going to effect small
26 mammals that are going to affect birds because they
27 feed on small mammals, that's generally the concept
28 we try to look at in terms of habitat.

29 Q Could we turn to your
30 prepared evidence on page 18 in the middle paragraph?

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1 I don't know how you do these -- achieve the design
2 specification requirements for drainage facilities when
3 you're doing it in the wintertime. Can you -- or are
4 you really going to design all those in the summertime?

5 A Well, the design would
6 be specified and laid out in a conceptual way. The
7 point where it would be applied in the field would be
8 determined in the summertime. For example, we will have
9 specified how, for a particular drainage course, a mound
10 break would be built, and the survey crew in the field
11 will identify the location where it will be built, and
12 that would be done in the summertime.

13 Q These will be serviced
14 without track vehicles? How do all these -- quite
15 a bit of summer activity and I was just wondering
16 how you service these?

17 A I would say that that
18 depends on the extent of the servicing, and I'm sure
19 Mr. Williams can broaden on this.

20 WITNESS WILLIAMS: Yes, we
21 have done quite an extensive study on various methods
22 of surveying the line, including both winter and summer
23 and at the present our proposed method is to do it
24 in the summertime with crews mainly walking on the
25 line. They would be taken to the work area by heli-
26 copter and the line cut in, if necessary, in the
27 boreal forest would be done with hand chain saws.
28 The crews would probably live on a barge that would
29 be moved along the river every two or three weeks
30 to put them closer to their work, but they would be

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1 transported from their living quarters to the work
2 area mainly by helicopter or by walking. We don't have
3 any plans for using soft track vehicles, for instance,
4 along the survey line in the summertime.

5
6 Q O.K. On page 19 of the
7 -- of this exhibit, I don't believe you addressed your-
8 self to the problems of stability -- well, mainly
9 stability, I suppose, of abandonment with the
10 -- bearing in mind that there has been an ice buildup
11 around the chilled pipeline, and this can cause some
12 instability at that time.

13 MR. GENEST: We intend to
14 deal with the subject of abandonment in Phase 2, Mr.
15 Commissioner.

16 WITNESS CLARK: I would also
17 Mr. Templeton, refer you to question 56 in the response
18 to the PAAG request for supplementary information. That
19 deals with some aspects of abandonment relative to the
20 chilled pipeline.

21 MR. TEMPLETON: O.K., I'll
22 withdraw that.

23 Q Now I think on page 21
24 you mention snow roads. What are your alternatives
25 if insufficient snow exists to construct the snow roads?

26 WITNESS WILLIAMS: Mr. Templeton,
27 we have dealt with this question quite extensively in
28 one of the responses to the Pipeline Assessment Group.
29 If you haven't had an opportunity to read it, I could
30 get the number here.

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Q No, if you could just --

I don't need to read the exhibit. What I am really getting at, is do you intend to make snow, I guess. If there isn't enough snow, are you going to make it?

A Yes, in this response to the question -- I still didn't find the number -- but that is suggested as one means of getting an early start in a year of very light snowfall. But we have, during the research work at Inuvik we did have a snow-manufacturing machine. We did find it a pretty slow process and we have been back to the manufacturers and they have done some more work on larger equipment that would be better adaptable to our use. In addition, at Inuvik -- and this snow road was constructed in early 1974 -- no, in December, November-December of '73.

Q Yes.

A IT happened to be a particularly light early snowfall year, as compared to the previous year, for instance, where I think there was 30-odd inches at Inuvik in October. It was a light year. We did try snow manufacturing. We think that it has its application. We also harvested snow from Dolemite Lake and hauled it to the site. In fact that's the way most of the snow road was constructed. We think this is a viable alternative to using natural snow that falls where we require it, and we were successful in constructing, in our opinion, a very good snow road early in the year, in a year of very light natural snowfall.

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1 Q I do not dispute that.

2 The question though is, is the very sizeable amounts
3 of water required to make snow and the access roads
4 to the lakes when you want to harvest the snow off
5 of the lake and the environmental effects of all this
6 taken into account in your impact assessment?

7 WITNESS WILLIAMS:

8 A I would say the report
9 on the work at Inuvik and at Norman Wells and other
10 locations and the response that we have made to the
11 Assessment Group has had review by environmentalists.

12 Q To the lakes -- you know,
13 we are talking about removing verysizeable amounts of
14 water from many lakes along the route. I did not
15 see anything in the assessment that said that.

16 A In another response to the
17 Assessment Group where we estimated the quantities
18 of water required, we picked a couple of typical spreads
19 and indicated what our estimate of the water
20 requirement for snow road construction would be.
21 Certainly in our opinion it is much less water is used,
22 is required when you are converting it to snow through
23 a snow gun, than it would be if you constructed
24 an ice road by sprinkling water on the tundra or
25 the surface or what have you.

26 Q I would agree with that.
27 But a lot depends on where you take the water
28 from, as to whether it is a significant amount or
29 not.
30

On page 28 in reference to

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1 the coastal route, you state, "It presents
2 no major problems." Are you speaking about engineering
3 problems of the pipeline or the whole problem including
4 the ecosystem?

5 WITNESS CLARK:

6 A I would suggest that
7 that is the total problem including the ecosystem,
8 when one takes into account the routing of the line
9 and the timing of construction, the timing of patrols,
10 the frequency of patrols, these have all been
11 looked at in detail by both environmentalists and
12 engineers and each have their concerns. I believe
13 that by and large they have been satisfied to the
14 extent possible.

15 Q I am not trying to
16 say that this is an easy thing and you have not done
17 it because I recognize the problem, but how do you
18 weigh the effect on birds and the effect of say,
19 putting a pipeline across a very unique landscape?
20 There are not any more of those on the mainland
21 of Canada that I know of like that, and the risk
22 of the calving grounds of the Caribou herd, I
23 realize that you are not really in the calving
24 grounds but you are pretty close and if you have
25 summer operations for a compressor station there are
26 effects, and people and machines and all the problems
27 that people and machines bring on, so is there -- I
28 do not know how you weigh that and I would like
29 to hear how you do it.

30 A Well, that was

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1 discussed by panel one to some extent. From our
2 point of view we are charged with the responsibility
3 of developing a design, and when we develop that
4 design we approach it on an interdisciplinary basis
5 and in order to develop that design we have to collect
6 a substantial amount of field data, and in
7 collecting that field data, we work closely with the
8 Environmental consultants, as well as engineers. --
9 And we bring to bear all of the points of view.
10 There is no blind lady that is holding two scales
11 that is going to weigh one or the other. A lot of
12 it is judgment and we do not rely entirely on our
13 own judgment, we rely on experts in other disciplines
14 to advise us and we respond and interrelate with them
15 and come up with what we think is a solution that
16 presents no major problems.

17 Q Well, I suppose that
18 every environmentalist would weigh that in his own
19 and mind/as a blind lady he would weigh it in a different
20 way and I am trying to ask if you have biases too,
21 I suppose --

22 A Indeed, I would admit
23 to that, sir. We have given ground on many occasions.

24 Q You mentioned, Dr.
25 Clark, that rerouting the new alignment east of the
26 Mackenzie by Fort Simpson has close to twice as many
27 lakes as the other route. In the amendment provided
28 for the relocation, I do not notice any geotechnical
29 information.

30 A There is the terrain

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1 typing of course and --

2 Q Yes, there is the
3 terrain typing from aerial photographs --

4 A Yes, now we viewed
5 that at the time as being a lateral shift of the
6 line and at that point in time we had completed our,
7 or were near completing our analysis of several
8 thousands of bore holes which were analysed for
9 each terrain unit and we were very confident that for
10 application purposes, for feasibility, that the
11 terrain information gave us enough data to have an
12 input into the drawing of the line. Now, there is
13 no question that there are many areas along that
14 route that will require a detailed geotechnical
15 investigation and we have, for instance, right now,
16 land use permits to pick up this bore hole information,
17 to gather samples, to do tests. We have made
18 soundings of the river, but we also recognize
19 this with every river of any significant size and
20 slopes that we will require drilling in the river,
21 we will require drilling in the banks, but it has not
22 been done --

23 Q I can understand
24 but I think what you just said was that you are
25 confident of the engineering, your engineering
26 capabilities to make a safe and adequate structure,
27 but you did not mention the environment.

28 A Well, again, I use these
29 things interchangeably, in concert with people looking
30 at terrain -- we had vegetation people classifying

1 vegetation and looking at that. We had the
2 environmental consultants giving their preliminary
3 assessment and they feel the same as we do that
4 there will be a certain amount of field work still
5 required there.

6 Q Did you want to add
7 anything else?

8 A No, sir. That is it.

9 THE COMMISSIONER: Could
10 I ask a question, Mr. Templeton.

11 Q When you adopted that
12 route change, the route that now takes you east
13 of Fort Simpson and avoids the crossing of the Liard,
14 was there any consultation with the environmental
15 people at Northern Engineering about that new
16 route, before the route as we know it, that is, as
17 contained in the amended application was put forward?

18 WITNESS WILLIAMS:

19 A Mr. Commissioner,
20 I think last week I testified that when we started
21 seriously looking at the Fort Simpson alternative
22 which was, I think, was early '74, that the information
23 was then given to the environmentalists almost
24 simultaneously for their inspection.

25 Q Well, Dr. Clark, I
26 am trying to understand the significance of an
27 answer you gave a moment ago to Mr. Templeton. You
28 said that along the new route, on the east side of
29 Fort Simpson which extends for 297 miles, that
30 you had carried out terrain typing from aerial

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1 photographs, but that you had not carried out any
2 bore hole work. Is that -- do I understand this
3 correctly, is that the situation?

4 WITNESS CLARK:

5 A Yes, sir.

6 Q Well, had your environ-
7 mentalists been on the ground, so to speak, over that
8 297 mile route at the time that the proposal was
9 given to them for their inspection in the way that
10 Mr. Williams has just now outlined?

11 A My recollection is
12 that some of them had. Do you recall --

13 WITNESS WILLIAMS:

14 A I am sure that they
15 had not been over the complete line, but certainly
16 in their earlier studies, going back several
17 years that they had covered part of that alternative.
18 Also in mid - - in July, I think it was of '74 I
19 participated in a reconnaissance, a detailed
20 reconnaissance with Mr. Day and Mr. Watson looking
21 at the route as filed and comparing it against the
22 route as amended and with the exception of the
23 Ebbutt Hill feature, we could find really very little
24 difference. It is only a lateral shift of, I think
25 at the most, 25 miles and for the most part, as
26 I say, except for the Ebbutt Hills feature, the
27 terrain is very similar.
28
29
30

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1 MR. TEMPLETON: Mr. Clark,
2 your impact assessment was submitted before you did
3 -- before you came up with this re-location, I believe.

4 WITNESS CLARK: Yes.

5 Q Your revision, and I guess
6 it's called 14-D sub-section (7), I think that's the
7 new volume regarding the re-location, you have a few
8 -- I don't know how many pages but there are very few
9 pages regarding the environment. You have a list of
10 birds, no geotechnical information, and I'm wondering
11 if you consider that an impact assessment of fairly
12 substantial length of line? I think the environmental
13 impact of the project, this is in the revised, I
14 think it's sub-section (7), is that the right title
15 description for that volume? Or is it Exhibit 66,
16 would that be it?

17 A Yes, I have Exhibit 66
18 here.

19 Q The environmental impact
20 starts on page 16 and goes through to 19 -- sorry,
21 20, and then there is -- well, just to 20. Is this
22 an adequate impact assessment?

23 A I think it would have to
24 be read in the context that it is a lateral shift and
25 it would certainly -- the total impact assessm ent would
26 have a bearing on this particular section of the route
27 as well.

28 Q Well, lateral -

29 A As to your question of
30 question of whether it's adequate, adequate for whom?

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1 We felt it was adequate.

2 Q I could make a suggestion.
3 I believe the onus of proof of the effects on the
4 environm ent is up to the applicant, isn't it?
5

6 A I believe that since it
7 was filed it was accepted as adequate by our client,
8 for the purposes to which it was to be put.

9 Q So we should ask Mr.
10 Horte again, should we?

11 MR. GENEST: Well, sir, I
12 don't like to use technical objections with Mr.
13 Templeton, but surely again that is a matter for
14 your judgment and for debate in argument, whether it
15 is adequate or not. I gather Mr. Templeton feels it's
16 not and ^{he} can address you on that, you have to make that
17 determination.

18 THE COMMISSIONER: Yes, I think
19 that is a sound objection. Mr. Clark and his colleagues
20 I am sure if you pressed them, would say, "Yes, it
21 is adequate," and I think if we were to press you, you
22 might conceivably suggest to us it was not adequate.
23 We might not be an awful lot farther ahead simply be-
24 cause we probably all knew that anyway.

25 (LAUGHTER)

26 MR. TEMPLETON: I'm certainly
27 learning a lot this morning.

28 Q Dr. Clark said that the
29 amount of differential heave over the pipeline length
30 of 100 to 150 feet should not exceed 2 1/2 to 4 feet,

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1 I think.

2
3 A I believe that's correct,
4 sir.

5 Q This is quite a range and
6 once again I'm not talking about the integrity of the
7 pipe because I'm talking about the consequences if it
8 does fail, you know, how you get in to repair it, and
9 I'm worried about running all over the coastal plain or
10 wherever you have to, and I wonder if, because this is
11 such a pretty wide range and also it's a rather unusual
12 temperature for a large diameter thick walled pipe,
13 that you hadn't considered having some kind of a test so that
14 you could narrow down that range and we're not -- we
15 wouldn't be so worried about you going in and repairing
16 a line break in the summertime.

17 A Do you want me to address
18 the line break repair, or the stress to the curvature?

19 Q I think my question was
20 that I'm concerned about all line breaks in the summer
21 that you have to fix in the summertime; but then of
22 course you don't know where they are, so it's a little
23 hard to say what you're going to do, I suppose. Perhaps
24 you can, but I would have thought that perhaps a test
25 would have -- so that we would know what stresses you
26 were taking into account, would be, what are the chances
27 of a break.

28 A Well, from our point of
29 view, again we would be faced with a particular region,
30 what allowable curvature the pipe can tolerate without
breaking, without being over-stressed, and it's our

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1 charge then to come up with a design that would keep
2 the movement to within those limits. Now insofar as
3 summer repair is concerned, we're in areas of unfrozen
4 soil of course, because that is the only place where
5 we would have frost heave.

6 Q But you can have a line
7 break apart from frost heave.

8 A Oh, I was dealing with
9 this differential heave associated with frost heave.
10 Well, as I think Mr. Williams has cited some examples
11 of how summer repairs would be carried out and I know
12 that these questions will be put to --

13 Q The main question now
14 then was this is a theoretical -- you're -- it's a
15 theoretical calculation that you arrived at rather than
16 a theoretical calculation plus a test, to figure out
17 the capabilities of the pipe to withstand differential
18 settlement from any cause.

19 A I think we're getting
20 into stress analysis, sir, and I don't purport to be
21 an expert on stress analysis, but there will be one
22 on the next panel and I cannot go into the detailed
23 stress analysis.

24 Q O.K.

25 A We are given bounds within
26 which we have to work. Our job is to make sure that
27 the design satisfies those bounds, and insofar as
28 repairs are concerned, our job is to make sure there's
29 no need for repairs and if we fail, then there is a need.

30

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1 Q Well, I'll leave it
2 till the next panel then regarding stressss. Dr. Slus-
3 archuk, you said that the company could monitor the
4 heave of the pipe, and if the heave is found to be
5 excessive, remedial measures could be taken. I think
6 that's on page 2341. What are these measures?

7 WITNESS SLUSARCHUK: The
8 remedial measures, sir?

9 Q Yes.

10 A Surcharging, sir, would
11 be one. Going in and putting some more surcharge over
12 top of the frozen bulb.

13 Q Is that the only one?
14 Would you take out frost-susceptible material?

15 A If it was on a very
16 localized basis there, we could steam inject and
17 thaw out, for example, a little bit. There is directly
18 under the pipe, we certainly wouldn't propose that for
19 a very great length, that's for sure.

20 Q Would these be -- when
21 would you do these, what time of the year?

22 A Well, sir, again you're
23 asking me questions that I'm not the best to respond to.

24 WITNESS CLARK: Perhaps I
25 could add a bit to that in that frost heave occurs over
26 a period of time at a diminishing rate, as we've shown,
27 that there would be flexibility as to the time of
28 year. I could not see anything happening with respect
29 to frost heave so dramatically that it would require
30 instant response. I believe that in many cases the

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1 preventive measures could be carried out in the winter.

2 Q O.K. On page 6 of the
3 prepared evidence, are the areas where the frost-susceptible
4 soils will be replaced presently known?

5 A We have not done a mile
6 by mile design as yet. We have an indication of frost
7 susceptibility.

8 Q Do you have any idea when
9 -- how deep you would take out frost-susceptible soil?

10 A It would depend upon
11 site conditions and how -- there's two reasons to take
12 out frost-susceptible soils, one is we replace it with
13 a non-frost-susceptible material, the frost bulb
14 penetrates much more quickly as I know you are aware,
15 and the resistance at the freezing front is then
16 increased rapidly; also within the zones through which
17 it penetrates there would be no ice lensing, so we get
18 two benefits:

19 (1) is the fast penetration of the frost bulb, and
20 (2) is a limiting ice lensing within that material.

21 I wouldn't see that this
22 particular solution would be widespread. It would be
23 in local areas.

24 Q And the material that
25 you'd replace the frost-susceptible soil with is al-
26 ready shown in the gravel.

27 A There are approximations
28 made. Any material of non-frost susceptible criteria --
29 coarse sands or gravel or crushed rock -- could be used
30 there.

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1
2 Q I'd like to turn now to
3 the frost bulb, and I have a little difficulty accepting
4 the description of a frost bulb, which has a somewhat
5 spherical shape to me. I don't want to over-dramatize
6 it, but it's circular in one end cross-section, but in
7 longitudinal direction it could be described as a wall,
8 and perhaps that's not a fair term but if you could
9 suggest one not so dramatic I'd be willing to accept
10 it.
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1 A That is quite acceptable,
2 sir.

3 Q Well, has the downstream
4 environmental effects of the problems associated with
5 this frost wall or wall of frozen material or whatever
6 you call it been estimated?

7 A They have been discussed
8 at length and we again in design have put forward
9 a number of conceptual designs that we believe will
10 satisfy the drainage requirements and prevent ex-
11 tensive downstream shadow effects.

12 Q This includes the wetlands
13 because this is a pretty long wall now, it extends
14 from the Alberta border all the way north, does it
15 not?

16 A It extends from the
17 Alberta border all the way north and I would not
18 conceive of it -- or I would not visualize it as
19 a wall in permafrost soils.

20 Q Well, it is a frozen
21 block up to 15 feet high, is it not?

22 A Perhaps in perma-frozen soils
23 it would perhaps be better to visualize it as a
24 brick in the wall --

25 Qardon me?

26 A As a brick in the wall--
27 the soil around the pipe is frozen, but the soil
28 around -- the soil is all frozen in permafrost
29 soils.

30 Q All right, what you

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1 are saying, you are differentiating between the
2 continuous and the discontinuous zone, right.

3 A Frozen and unfrozen,
4 yes.

5 Q So, okay, we can
6 keep it to say, Norman Wells or Sans Sault or
7 somewhere there?

8 A Mm-hmm.

9 Q Well, have the downstream
10 environmental effects of those been analysed and are
11 they included in your impact assessment?

12 A I believe they are.
13 My very early stages of involvement with this
14 project, we had discussions with our environmental
15 consultants as well as our staff members and it is
16 an area that has certainly received a great deal
17 of dialogue as to whether they considered it or
18 not I guess you will have to ask them, but they
19 certainly consider to the point that they ask for
20 considerable detail from us on our, on the config-
21 uration and the effects and the measures that we
22 would propose.

23 Q The impact assessment
24 does not really give you that impression, I do not
25 think, but I think I accept -- I know that you did
26 a lot of work on it -- it is that blind lady with
27 scale again, whether --

28 A We certainly have
29 not made ever any attempt to obscure any aspect of
30 this line from our environmental consultants. We have

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1 laid everything right on the table and time and time
2 gain and we got their input and we got their concerns
3 and we have gone back to the drawing boards and
4 tried to come up with something to satisfy those
5 concerns. -- And I know of no instance at this
6 time where some of our consultants and there are
7 not
8 many that have said, no, that is environmentally
9 acceptable.

10 THE COMMISSIONER:

11 QDr. Clark, going back for
12 a moment, Mr. Templeton asked us to think of the
13 frost bulb as a wall of frozen material, perhaps
14 15 feet in diameter extending from Norman Wells south
15 to the Alberta border. Now, you said that thinking
16 of it as a wall of frozen material was a reasonable
17 way of thinking about it. What about the notion
18 that Mr. Templeton put to you of thinking of it
19 as a wall of frozen material extending from Norman
20 Wells, which I take it is the -- where the line
21 between continuous permafrost and the discontinuous
22 permafrost zone can be found, extending from there
23 to the Alberta border. Do you want to comment on
24 that?

25 A Yes, I think that per-
26 haps a better way to visualize that, sir is we are
27 going through discontinuous permafrost zones.
28 There are patches of frozen ground and unfrozen ground.
29 Where the pipeline goes the soil around it will
30 freeze, so within that zone we will be connecting the
unfrozen patches.

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1 Q Yes, you will be
2 extending in a sense the continuous permafrost zone
3 down to the Alberta border.

4 A On that width, that is
5 a good way of looking at it, yes.

6 Q Yes, now, you will
7 be doing that on the east side of the Mackenzie
8 River?

9 A Yes, sir.

10 Q Could I ask you
11 another question, just while I have taken the liberty
12 of interrupting Mr. Templeton for a moment, in your
13 prepared evidence, you said at page 13 -- you might
14 take a glance at this if you wish, Dr. Clark. --
15 At the top of the page you said "Our main emphasis
16 to this time has been placed on establishing perfor-
17 mance criteria rather than design criteria, for
18 example, it is impossible to establish a single
19 criterion such as terrain typing as a basis for
20 a route location. Terrain is one of the
21 many considerations that goes into selecting the
22 route. Other considerations include environmental
23 concerns. In many instances we have moved the
24 route to avoid an environmentally sensitive area and
25 by so doing have traversed less favourable ground than
26 would have been selected solely on the basis of
27 terrain."

28 Now, you mentioned the
29 movement of the route at a stream crossing in
30 Alaska earlier this morning, a movement that your

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1 environmental advisors and you agreed upon. You
2 say here in many instances you have moved the
3 route. -- I take it within the Yukon and the
4 Northwest Territories -- to avoid an environmentally
5 sensitive area and by so doing have traversed less
6 favourable ground than would have been selected solely
7 on the basis of terrain. I do not want to ask you
8 to discuss something that does not fall within your
9 field, but since this is in your own prepared
10 evidence, have you got a list of those movements
11 of the route, when they were made and the environmental
12 concerns that resulted in those movements being
13 made?

14 A We have -- and I believe
15 Mr. Watson had with him last week, a list of minor
16 movements, but in many cases, this would result with
17 two people or three people sitting with an alignment
18 sheet and sketching out a possible route. I can
19 recall one instance, but I cannot recall the location
20 that in a route which would probably -- or a segment
21 of the route which would probably be on somewhat
22 better terrain, we were required to cross a river
23 by the
24 twice, and it was pointed out that environmentalists
25 that if we moved it a little bit, that we would
26 only cross that once, and -- in moving it, it might be
27 somewhat more, less favourable terrain, but nothing that
28 would present geotechnical problems and it would be
29 moved, and it is a little happier situation from
30 their point of view -- we did not record every one
of these events.. It was a day by day exercise.

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1 Q Mr. Dau told us last
2 week about the movement of the original route to
3 avoid an environmentally sensitive area in the
4 vicinity of Travaillant Lake. ARE you saying --
5 let me put it this way -- are you able to tell me of
6 any specific instance that you can point to on
7 the map, where the route was moved to avoid an
8 environmentally sensitive area, or are you saying that
9 it was all done by an examination of the alignment
10 sheets and that no record was kept of the movements --

11 A Well, no -- records were
12 kept of a lot of these movements depending on the
13 circumstances how they came about. Many of them are
14 relatively minor movements within a hundred feet or
15 so, but the Travaillant Lake move, as I recall, did
16 not present any substantial concerns to us with
17 respect to terrain in one location or the other.

18 Q As I recall there was
19 another fairly significant move in the Trout Lake
20 vicinity, but I am going back a couple of years now
21 and drawing on memories and I can certainly refresh
22 myself with this by going over Mr. Watson's list.

23 Q Well, you have said
24 in your prepared evidence that in many instances you
25 have moved the route to avoid environmentally
26 sensitive areas, and by so doing have transversed
27 less favourable ground than would have been selected
28 solely on the basis of terrain. Now, what I am in-
29 terested in is knowing what those many instances were,
30 what the environmentally sensitive areas were and

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1 I would take it that in some instances it may well
2 be that environmentally sensitive areas were pointed
3 out and they may well on the basis of a judgment
4 relating to all the considerations involved, it may
5 have been decided that you could not avoid the
6 environmentally sensitive areas.

7 A Yes, sir.

8 Q Well, I would like to
9 know something about that since it has been indicated
10 by you in your prepared evidence that this was a
11 process, so to speak, an orderly process in which
12 these matters were raised and considered and movements
13 of the route made.

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WITNESS CLARK: Yes sir.

THE COMMISSIONER: I take it
at the moment you are not really able to give me ^{any} specific
instances where the route was moved owing to the neces-
sity of avoiding an environmentally sensitive area?

A I can think of a couple
of examples and they've already been discussed, of
pretty large movements, but the alignment sheet work,
for instance the give and take, I can't recall those
from memory, I can recall it happening and I can under-
take to look at records that are available.

Q Yes, I think I would
appreciate it if you would because you and your colleagues
will be back again in April.

A Yes.

Q Just going back a sentence
or two, you said,

"Terrain is one of many considerations that goes
into selecting the route."

Now when the change in the route east of Fort Simpson
over a distance of 297 miles was decided upon, terrain
certainly was one of the things that was considered
because you told me that Dr. Mollard's aerial photo-
graphs were considered. What isn't clear to me yet --
and I'm raising it now so that Mr. Genest will be
aware of it, so that you and your colleagues will be
aware of it -- what isn't clear to me yet is whether
any other consideration besides terrain went into the
selection of that route on the east side of the river,
that change in the route on the east side of the river?

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1
2 A The selection, I would
3 say, was similar to the others. At the time that the
4 route was laid on the alignment sheets that were filed
5 with the first application, I was closer to route
6 selection personally than I was when the east of Simp-
7 son route was laid on, but I know the geotechnical
8 people were working with the pipeline people and the
9 environmental people were also looking at the area and
10 I assume that the same processes went into that route.

11 Q Well, you can elaborate
12 on that after you've looked into the matter.

13 A I would like to do that,
14 sir.

15 MR. SCOTT: Mr. Commissioner,
16 it is 10:30 and I see Mr. Carter has beaten us out to
17 the coffee table.

18 THE COMMISSIONER: Well, we'll
19 take a short break.

20 (PROCEEDINGS ADJOURNED AT 10:30 A.M.)

21 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

22 MR. TEMPLETON: Q Dr. Clark,
23 I don't think we quite finished the frost wall, and
24 what are the downstream effects of that? What would
25 be the environmental implications of that wall as
26 downstream?

27 WITNESS CLARK: You're
28 referring to the overland area now rather than
29 river crossings?

30 Q Yes.

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1
2 A There would be a localized
3 influence on drainage water past that frozen area.
4 That's the downstream --

5 Q Possible erosion?

6 A If there were no preven-
7 tative measures built in there would be erosion.

8 Q How about the water
9 supply for wells? I realize there aren't many people
10 there now, but then I suppose some day there might be.

11 A I could visualize a situa-
12 tion where one could in future years tap the potential
13 source of water that might be a potential source now
14 that wouldn't be then. It depends upon how close and
15 how aquifers are re-charged and so on. I think ^{if} anyone
16 were to drill a well in that part of the country they
17 would seek out a pretty well-defined aquifer

18 Q How about instability due
19 to increased pore water pressure, is there any danger
20 of that?

21 A Well, our assessment of
22 slopes, of course, will take that into consideration
23 and where we have a significant slope we would cross
24 that at right angles to the contours, which would mean
25 that we're not creating the wall in the direction of
26 a flow. On the very shallow slopes that we cross,
27 before we parallel a slope, that slope would be
28 assessed in the light of the pore pressure situation
29 and if it was found to be a factor which would affect
30 the stability, we have several options to alleviate the

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1 floor pressures, using several procedures.

2 Q What would those be?

3 A Mainly drainage. It
4 would depend upon the nature and source of the floor
5 pressure. For instance, if there was a deep aquifer
6 that we didn't identify because it was too deep, or
7 deeper than we had drilled, for instance, and if ulti-
8 mately we froze that off, there would be a surface
9 indication and we could then impliment, I believe,
10 drains to relieve excess pore pressures.

11 Q Well, do you consider
12 that this barrier wall or whatever it is to the move-
13 ment of ground water, you don't feel that it's
14 environmentally significant?

15 A It's significant
16 environmentally, yes, and that's given us cause to
17 give that a lot of consideration, and develop methods
18 which we think in those circumstances where the move-
19 ment is significant, to restore the downstream effects
20 as quickly as possible.

21 Q And this restoration
22 would be both inside and outside the right-of-way?

23 A The mechanics of the
24 restoration would be largely on the right-of-way, the
25 cross-drains and diversion dykes and so on.

26 Q Do you consider it your
27 job, if there was say erosion downstream, outside the
28 right-of-way, that that would be part of, the restora-
29 as
tion part of your job?

30 A If the erosion was

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1 associated with the pipeline, yes; but for instance
2 there's no way that we could ever undertake to stabilize
3 all the land slides in the north.

4 Q Oh, no, no, I'm not
5 talking about that. As a soils engineer you'd
6 rather like to try.

7 A The point I guess I'm
8 getting to, Mr. Templeton, is that I think that there
9 is well-established legal precedent that if something
10 on the right-of-way results in a situation off the
11 ^{the right of way} right-of-way, people would be responsible. I'd have
12 to turn to some of my legal advisors for advice on that.

13 Q I don't think I want to
14 ask a lawyer, so I'll drop it. Dr. Cooper, in your
15 experience in Alaska, could you tell me the minimum
16 size of culverts that are presently being used on the
17 roads around Prudhoe Bay?

18 WITNESS COOPER: No, I couldn't
19 speak to that. I had really no input on the road
20 design from the Yukon River to Prudhoe, just on the
21 pipeline crossing design.

22 Q I see. Anybody else on
23 the panel know that answer?

24 WITNESS CLARK: The question
25 was the minimum size?

26 Q Yes.

27 A I don't know the minimum
28 size, but I've looked at culverts on the road sir, but
29 I've never made measurements of them.
30

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1
2 WITNESS HARDY: I think that
3 figure is available in the literature but I couldn't
4 put my finger on it this morning. But I think we could
5 get that figure.

6 Q Well, my observation is
7 that, I think they started with 48-inch minimum and
8 we're getting larger than that now, I believe.

9 WITNESS CLARK: I would refer
10 you to a report here that was filed earlier this
11 week on the reconnaissance made in Alaska, another
12 one of the inter-disciplinary reconnaissances of one
13 of our engineers and a fish biologist. They did look
14 at culverts, but I don't know how much detail is in
15 there. They were primarily concerned with the gravel
16 in the active flood plain of the Sag River, but I
17 believe there's observations of culverts.

18 Q Well, I wanted to talk
19 about the buildup of ice in these culverts, and I
20 wondered if you had any idea of what you were going
21 to use as you will undoubtedly be putting in some
22 permanent access roads with culverts, and if you had
23 an idea of the minimum size for those?

24 A There is a question
25 relating to that topic that was raised during the
26 PAAG request for supplementary information. I see
27 Mr. Williams is looking through the index now. Perhaps
28 he could advise us as to what number it is.
29
30

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1
2
3 WITNESS WILLIAMS: It's
4 question No. 41.

5 Q Could you tell me the
6 size?

7 A It may take a little
8 while.

9 Q O.K. Well, I guess
10 probably what I'm asking, I think that particular
11 question has to do with velocities.

12 WITNESS CLARK: I think it
13 also would be involved on permanent access roads.

14 Q Well, it isn't the
15 number I was wondering about, it was the matter of
16 ice buildup that you get in these areas, where you have
17 a spring or some feature where you have water running
18 in fairly late in the fall. This is usually governs
19 quite often the minimum size. It doesn't govern the
20 maximum.

21 A Yes sir.

22 Q It quite often governs
23 the minimum, and I was wondering if you had any idea
24 what those minimums were.

25 A I could get that figure,
26 sir, but I don't have it now.

27 Q Well, what I was getting
28 at was the relief culverts that you mentioned, Dr.
29 Clark, that would be going through this frost bulb
30 wall.

A Yes sir.

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Cross-Exam by Templeton

1
2 Q I think you said they
3 were small insulated culverts that would relieve the
4 pressure or it would allow the passage of water through
5 the frost bulb.

6 A Yes sir

7 Q And what I'm having
8 difficulty understanding is how that is going to work
9 if they're small, regardless whether they're insulated,
10 and in fall or winter when you have the movement of
11 water and it's a fraction of a degree off freezing,
12 and it's going through this small pipe, and even though
13 the pipe is insulated it's still below freezing because
14 it's going through the frost bulb. I can't understand
15 why that won't freeze up.

16 A Well, if it were a very
17 small flow that is shut off during winter freezing it
18 would freeze up; but in that case if it is a very
19 small flow we would not see it necessary to use that
20 technique. What I gave as an example was where there
21 was a significant flow that would occur year-around,
22 and I can't -- I personally do not know of a site
23 for it specific case, and again to be significant flow there
24 would have to be a significant hydraulic gradient,
25 and for a significant hydraulic gradient there would
26 have to be a fair slope, and if there's a fairly steep
27 slope then we wouldn't be traversing it in the cross-
28 direction. We would have a much more favorable attitude
29 down the slope.

30 Q But you must have some
cross-slopes.

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A Oh, we have cross-slopes.

Q In the Mackenzie Valley.

A Indeed, but cross-slopes are generally flat for several reasons, from the aspect of slope stability as well as construction.

Q Well, I don't know how you are going -- I don't know how you first of all find these to get just the right flow of water, as I think if it does freeze up it will never thaw, will it, because it's in a frost bulb and it's going to be frozen, so if you misjudge and you put this culvert or drain or whatever you call it in, and it once freezes, it will stay frozen. So I can't -- and I don't know how you judge the amount of flow at this time or when you design the line that's going to say whether it's large enough and it's going to be continuous or intermittent or-- I find this --

A well, the amount of flow, of course, would have a bearing on the amount of insulation that's put around the line.

Q Yes, but the insulation only doesn't prevent the inside of the pipe from being below freezing, does it?

A It retards that, yes.

Q It slows it down, slows the movement down, into the gradient but it doesn't change --

A Well, it doesn't change the -- if you like, the cold flowing into the pipe,

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1 it prevents the heat flowing out of the water. The
2 heat that has kept that water wanting to flow.

3
4 Q But the inside of the
5 pipe is below freezing.

6 A Not necessarily.

7 Q Well, if it's through a
8 frost wall that's as low as zero degrees, I don't
9 see how it can help but --

10 A That would entirely
11 depend on the amount of heat brought in by the flowing
12 water.

13 Q Oh yes, if you have
14 enough flow of water, that's right, sure.

15 A That's the point I was
16 getting at, there has to be a significant flow of water
17 before this would be used.

18 Q But how do you know that?
19 How do you know that you're going to have a significant
20 flow of water all year long?

21 A Well, I think that there
22 would be enough -- very likely enough surface indication
23 now, of springs and so on where this buried aquifer is.
24 We are talking about an entirely hypothetical situation
25 here, as I'm sure you realize.

26 Q Well, but you've proposed
27 this as a method of getting rid of -- of getting the
28 water across the wall.

29 A Yes. That's one method.
30 There are other methods, of course, and that is inter-

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1 cepting it with a counter-force trench and bringing it
2 to the surface and carrying it across.
3

4 Q Well yes, but that
5 produces another problem, doesn't it? You're in effect
6 starting an icing then.

7 A Well, you would have an
8 icing if there was winter flow in that case, but again
9 if there was winter flow I would suggest that that water
10 is warm enough so that it doesn't freeze and that in
11 conducting it through that frost bulb, which at the
12 top is fairly narrow, we would get it through fast
13 enough and have enough conducted heat transfer so it
14 wouldn't freeze.

15 Q Well, I don't --

16 A It's not the same case
17 as the culvert, the icings of culverts, which is a pretty
18 well known phenomenon. This is almost a confined flow
19 that we're talking about.

20 A I can't understand how
21 there's warm water in the discontinuous zone, the
22 temperature of the ground is very close to freezing
23 and certainly in fall and winter, the water, unless
24 it's a spring, but we're not really talking about
25 springs because the springs go into a water course.
26 We're talking about the general movement of water
27 downhill in the soil, which is pretty common, isn't
28 it?

29 A Yes, we're talking about
30 aquifers that would have the capacity that would be

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1 comparable to aquifers that produce the springs.

2 Now where the aquifer has already decided to surface
3 somewhere else and create a spring, then we're dealing
4 with surface water. What I am talking about, if there
5 happens to be a confined aquifer that is intercepted,
6 very well that situation never would arise. I think that
7 the common problem of cross-drainage that we're dealing
8 with overland, is by and large surface drainage.

9 Q Well, have you done
10 any studies to indicate that?

11 A We have had our geo-
12 hydrologists look at situations and scenarios, if you
13 like, that could develop and our hydrologists are
14 evolving designs and these are indicated. We've also
15 looked, to the extent possible, at areas that depend
16 upon surface recharge rather than a sub-surface flow,
17 and the point that I again would go back to is that
18 where there is significant sub-surface flow there has
19 to be a significant gradient, and if there is a
20 significant gradient there is a relatively steep slope,
21 and if there is a relatively steep slope we're
22 crossing that down the slope, running with the water.

23 Q Do you intend to conduct
24 any studies regarding this movement of sub-surface
25 water?
26

27 A We've already initiated
28 studies of the movement of sub surface water. I des-
29 cribed the program that we're doing at Chick Lake,
30 which is being very informative, and I believe, if

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1
2 things are running on schedule, a geo-hydrologist is
3 in the field now looking at icings, gathering data.
4 We will be continuing the Chick Lake program this
5 year. In fact we have a fairly extensive data gathering
6 program that our client has approved for us to proceed
7 with this year to get us into the details required
8 for final design.

9 Q Will you be amending
10 your -- supposing you find something that this was
11 significant, would you be amending your impact
12 assessment?

13 A I have no idea as to the
14 procedure or requirements of amending impact assessment.
15 We would certainly be refining our designs as we develop
16 the final design.

17 Q O.K., on another subject.
18 In the discontinuous permafrost zone, which would cause
19 the least environmental change,^a chilled pipeline or a
20 non-chilled pipeline?

21 A That's a question we
22 would have to look at almost on a site specific
23 basis. Our concept has been to bring chilled gas down
24 to that point in the discontinuous zone where we can
25 then convert to a non-chilled mode and not have to deal
26 with major problems downstream problems of melting of
27 permafrost. We like the line where it is now. There
28 is an area where clearly it is better to be chilled
29 because the problems associated with massive ground
30 ice melting are not encountered with a chilled line.
There are other areas where it's clearly better not

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1 to be chilled because the problems perhaps would be
2 inhibiting frost heave. Then there's a grey area where
3 it could be a little bit one way or the other. We have
4 picked the area now that we can support, that we think
5 is the place to convert from chilled to non-chilled.
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1 Q That is about the
2 Alberta border?

3 A A little bit north is
4 where the last chilling station is.

5 Q Well, I am not arguing
6 about the continuous permafrost zone, but in
7 the areas -- say -- I have forgotten the mileages,
8 but it would be south of Bear River, south. You think
9 that it is better to have it chilled? You have
10 no ice lenses in this area, you have scattered
11 pockets of permafrost, it is true, in some places it
12 is fairly continuous, but there ^{isn't} much ice, massive
13 ice or things that would cause a problem. In
14 otherwords, why do you chill it as far south
15 as you do?

16 A Well, we believe, on
17 the basis of information that we have now, that is
18 what we believe is about the optimum point. We
19 know we can deal with frost heave. We are confident
20 we can deal with other factors associated with
21 chilling the pipeline and south of that point we
22 believe that we can deal with the melting of the
23 permafrost that exists beyond the last point
24 of chilling. But there is a grey area there and
25 we would actually like to keep some options open for
26 final design on a 50 mile basis or so.

27 Q I was not getting
28 that close I was talking in much larger scale than
29 that, but I suppose there is an economic advantage
30 and I do not think that there is anything wrong with

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Cross-Exam by Bell

1 an economic advantage of having it chilled farther
2 south --

3 A I agree and I do not
4 think that there is anything wrong with an economic
5 advantage, but as I understand it there is no major
6 economic advantage. It is about even.

7 Q There is no major
8 economic --

9 A That is my understanding,
10 but other people concerned with the flow of gas could
11 answer that better, but if there is an economic
12 advantage I do not think that it is a major one.

13 Q Is that so.

14 A It is certainly my
15 understanding.

16 MR. TEMPLETON: I will leave
17 it at that. Thank you.

18 THE COMMISSIONER: Mr.
19 Bell.

20 CROSS-EXAMINATION BY MR. BELL:

21 Q Mr. Commissioner, I
22 will try and be as brief as possible. I understand
23 that Mr. Scott is anxious to go and catch the dog races.

24 Dr. Clark, I think I heard
25 you say earlier this morning in response to Mr.
26 Templeton, that you cannot think of a case in
27 which your environmental consultants said, no, that
28 is not environmentally acceptable and I would like
29 to know whether that applies to route changes only
30 or to route selection in general.

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1 WITNESS CLARK:

2 A It would apply to the
3 complete picture taking into consideration the
4 route, the design and the time of construction
5 and so on. This may have happened and you may be
6 able to cite the events, but they are not known
7 to me if that is the case.

8 Q Would this apply to
9 the crossing of the Ebbutt Hills?

10 A Yes, no one has ever
11 not said to us that that is environmentally acceptable.

12 Q Dr. Hardy, there was
13 some mention made the other day of the Pointed
14 Mountain Line. Could you tell us again where that
15 is located and perhaps a little bit about your
16 involvement in it?

17 WITNESS HARDY:

18 A Well, it is only about--
19 it is less than 30 miles long, you see in the Territory,
20 and it cuts across a corner of the Yukon Territory
21 and then extends into the Northwest Territories,
22 and the milage in the Territories, my recollection is
23 that it is 27 or 28 miles and it runs to Pointed
24 Mountain. They have some gas wells there, you see.
25 --And it is an extension of the Westcoast Transmission
26 Line, you see.

27 Now, I have stated before
28 that I have had involvement in the original construc-
29 tion of the Westcoast Transmission Line starting in
30 1954 and so on. What I did not say was that since the

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1 line was put into operation, I have done annual in-
2 spections of their line, or their system in order
3 that they can meet the requirements of their insurers,
4 and my inspectionns have been confined to geotechnical
5 problems, or soil problems, stability problems, and
6 river crossings, and so on, you see.

7 Now, on the Pointed Mountain
8 LINE -- I cannot document this -- I am quoting from
9 memory -- I suppose I could if I looked back into
10 my own files, get more information on it, but that was
11 the first extension of their system in which the
12 route and the construction was assessed in terms of
13 the new environmental requirements of the Territorial
14 government, you see, and the Yukon, as I understand it,
15 accepted the requirements of the Northwest Territories,
16 and so it was experimental to that extent and again
17 my recollection is that Westcoast Transmission
18 retained a firm of consultants, in Vancouver I think
19 their headquarters are, to come up with -- to meet
20 the requirements of the Territorial government for
21 all the environmental impacts and so on, and my in-
22 volvement with it was simply I was asked to take a
23 look finally at two river crossings and to very
24 casually assess the location from the point of
25 view of the geotechnical situation so that I was
26 not involved in the -- I did give commitments on
27 the two major river crossings --

28 Q Which rivers were those?

29 A One is the Koyaaleer,
30 I think it is, and the other one is the LaBiche , that

1 is right, yes. -- And I will beat you to the gun
2 here, sir, one of these was not too successful and the
3 other one was reasonably successful. In other words
4 we misassessed the changes that developed in the river
5 pattern, you see, and so it has been a problem. They
6 are actually in the process of repairing this now.

7 Q What sort of problems
8 have arisen.

9 A There was a shift in
10 the river pattern, a very major shift that you
11 would normally expect to -- would never occur,
12 actually. It was quite a different situation from
13 anything that I had seen develop on the Westcoast
14 Transmission system, you see, in the previous 20
15 years, more or less. The line was interesting, of
16 course, from the point of view of the fact that they
17 did have the new set of regulations, they were
18 trying to meet, you see, and there were something
19 like -- and it was experimental, if you like, but
20 in terms of inspection there were twelve Government
21 inspectors on 27 miles of line, you see. If you
22 translate, extrapolate that to the Northwest Highway
23 system, it is an army of inspectors. You would
24 never have it, you see. Well, that is pretty well
25 my story, I think.

26 Q You mentioned that the
27 river shifted, is that right? The course of the
28 river moved, is that what you were suggesting?

29 A There was a flood
30 situation that developed that resulted in a major

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1 change in the river pattern. -- Upstream and downstream.

2 Q What sort of problems
3 did that cause for the line?

4 A Well, it cut into
5 one bank and exposed the pipe.

6 Q I see --

7 A My recollection is it
8 did not break it, but it exposed the pipe and
9 there is work going on, corrective work going on now.
10 Now, this is not completely unusual, , and
11 actually in my experience, you see, starting, going
12 back to 1952, we have never had a failure in the
13 sense of a pipeline being broken,
14 where there has been a design for scour depth, there
15 has been an engineering design for scour depth.
16 The errors in judgment that have arisen have been
17 in the selection of the sag points, and so pipes
18 have been exposed and have required, there has been
19 maintenance work, in some cases quite substantial
20 maintenance work, but out of this whole picture
21 we are now able to identify certain types of rivers
22 where the hazard of this sort of shift is more
23 severe than in other places, you see. So it depends
24 what you want to regard, you have to define failure
25 before you can talk in terms of the numbers of
26 failures you have had, and if we could find the
27 failure in its ultimate sense, that is a fracture
28 of the line, that has very seldom occurred,
29 you see, even where there has not been an engineering
30 design take place, there are a much greater number of

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1 cases where there has been exposure of pipelines.

2 Q Thank you.

3 Dr. Clark, have any studies
4 of the Pointed Mountain Line informed your processes
5 in developing the Mackenzie Valley Pipeline?

6 WITNESS CLARK:

7 A The situation is quite
8 different in that it conducts hot gas, but our engineers,
9 environmental consultants and others have looked at
10 that line, yes.

11 Q Have there been any
12 reports produced that we could refer to?

13 A I believe so. There
14 is -- there has been a Government report on the
15 Pointed Mountain Line that is listed in the documents
16 produced by the Government.

17 Q It is in the Government's
18 list?

19 A Dr. Hollingshead was
20 on a trip there and he could --

21 WITNESS HOLLINGS HEAD:

22 A There are some notes that
23 were produced as a result of a joint reconnaissance
24 between the environmentalists and myself.

25 Q Well, what I am trying
26 to get at is whether we will have access to any of
27 these notes or reports.

28 A That is a CAGSL report
29 as I recall, or in the form of a CAGSL report, but
30 I suppose --

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1 THE COMMISSIONER: If it
2 has been listed, you might get the number and turn
3 it over to Mr. Bell,

4 MR. BELL: Thank you.

5 WITNESS HARDY:

6 A I am sorry, Mr. Bell,
7 the involvement I just described to you a few minutes
8 ago was during the design and construction stage.
9 I did indicate that there was work involved on
10 the river crossing. I should have added that
11 that length of line does come -- is included in the
12 whole system for purposes of our annual inspections,
13 so I have seen the line annually since it was built.

14 Q Well, Perhaps I could
15 just ask you to go a little further then. What
16 sort of measures have been taken to remedy the
17 -- it was not a failure I understand, it was some
18 kind of erosion that took place along the line.
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WITNESS HARDY: Well, there

are -- you see, what has happened on the line is that there are quite substantial sections of it in muskeg were floated up and are above the surface, and that has not caused any great difficulty, but there is one stretch, a relatively short stretch, close to the northern end of the line in which there has been erosion and it's been carrying silt into the lake there. The Fisheries people are greatly concerned with this, and as far as I am aware, the company have -- the environmental factors do not come within my purview, you see.

I'm interested only in the soil factors that are involved, But my recollection and understanding is that the matter of the particular erosion in that area has been the subject of considerable study and co-operation between the regulatory authorities and the company, and that they have agreed on certain measures that would be taken. I understand they have been proceeded with, or are about to be.

Q You mentioned that there were environmental guide-lines under which the pipe had to be -- the line had to be constructed. Do you recall whether there were any socio-economic guide-lines in addition?

A I saw those regulations, not that I recall.

Q So as far as being a test, this line might prove valuable from the environmental point of view, as well as the geotechnical point of view, that you are talking about.

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1
2 A Well, a hazard to the
3 environment, it included everything except the
4 socio-economic factors, and of course there isn't
5 very little habitation up there in that area.

6 Q Are there any communities
7 nearby, do you recall?

8 A I can't recall any.

9 Q I think the Community of
10 Fort Liard is a small community but it's not far
11 from there, from the line. It's on the Liard River.

12 A Well, they're talking --
13 that is quite a way away. They're talking about a
14 road, you see, through that country to Fort Simpson,
15 and that of course would open up that country very
16 substantially. But I can't recall a single settlement
17 flying over that line, and we fly over it and set
18 down at several spots along the line.

19 Q Earlier this week the
20 panel was telling us about the test facilities construc-
21 ted by Arctic Gas at Prudhoe Bay, Sans Sault Rapids,
22 Norman Wells, and Calgary, and I believe you said,
23 Dr. Hardy, that in your opinion Canadian Arctic Gas
24 had committed to these research facilities, a level of
25 funding and resources which was rarely seen in Canada,
26 at least in the private sector. You mentioned research
27 projects with the National Research Council, I believe,
28 as well as with the University of Alberta. Could
29 you expand on that a little bit for me?

30 A I was referring specifi-
cally, sir, to the test section in Calgary,

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1
2 the frost heaving program because that is the one
3 that I had the most input into. I had no input, of
4 course, into the test section at Norman Wells. We
5 had some input, a fair amount, at Sans Sault Rapids
6 test section. I had no impact or input into the Prudhoe
7 Bay section. So those comments were, I thought I made
8 it quite explicit, were confined to the research pro-
9 gram that was designed and operated and got the approval
10 for it, by the N.E.S. staff

11 Now, from there on --

12 Q Excuse me, sir, I have
13 difficulty hearing you. I don't think your microphone
14 is on.

15 A Where would you like me
16 to back up to, sir?

17 Q Well, if I heard you I
18 could tell you. Well, perhaps you could just summarize
19 what you just said in a couple of sentences.

20 A Well, I was emphasizing,
21 sir, in the comments you referred to, I was dealing
22 specifically with the Calgary test section. I described
23 that I had no involvement with the Norman Wells
24 test section, and nor with the Prudhoe Bay test section.
25 We did have involvement with the the . Sans Sault
26 test section, which was set up by the Northwest Study
27 Group; but the Calgary test section was set up under
28 N.E.S. and it was to deal specifically with the
29 problem of frost heaving, which we had recognized
30 from day 1 almost was a problem. But it was not the

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1 type of problem that would -- that was a major factor
2 in feasibility, and so you dealt with other things,
3 including location and environmental factors, it was
4 always recognized that you had to come back eventually
5 and deal with this frost-heaving problem. What I was
6 trying to explain is that that program was set up on
7 a sound scientific basis, as in my experience would
8 have been the case if it was being done under the
9 auspices of a university department at the University
10 of Alberta, or if it was a program that was going to
11 be undertaken by the Research Council of Alberta, which
12 I've had considerable experience with. I think, too,
13 I've had a more limited experience with the Division
14 of Building Research of N.R.C., but I think it would
15 meet their criteria for the planning and the general
16 study of the program on which you would base your
17 application for funding. I am saying that that
18 program was presented to CAGSL with the same terms of
19 reference, if you like, on the same context as if
20 N.E.S. had been applying for funding from a pure
21 research organization or an organization primarily
22 concerned with research only. Now this was an applied
23 program, but it was not just a fly by night sort of
24 thing that we'll go out there and run a few quick
25 tests and come up with some answers. It was a valid
26 research program. That's the point I was trying to
27 emphasize, sir.

28 Q I believe that Mr.
29 Williams mentioned that approximately \$700,000, is that
30

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1 correct?

2 A That's correct.

3 Q At the Calgary facilities.

4 How does that compare to other types of research that
5 you've been familiar with?

6 A Well, that's really manna
7 from heaven. These tests that I was describing in
8 lignosol yesterday or the day before, we had funding
9 from N.R.C. on some of those.

10 WITNESS MORGENSTERN: I might
11 comment that the total funding of geotechnical research
12 in Canada in extra-mural institutions like
13 universities, is less than half a million dollars a
14 year.

15 WITNESS HARDY: Back when we
16 were doing work on lignosol^{if}, we had \$5,000 we thought
17 we had good support, and what I did say the other day
18 and I'll repeat it here, in line with what Dr.
19 Morgenstern has just said, that that program funded
20 to the level of \$700,000 is the biggest program of the
21 kind having to do with frost action in soils, and
22 I'm not so sure it wouldn't qualify as the biggest
23 geotechnical program up to that time.

24 Q M-hm.

25 A That had been funded in
26 Canada.

27 Q Mr. Williams, I think we
28 heard you say the other day that the total cost of
29 the test facilities was about \$9 million, is that
30 correct?

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1 WITNESS WILLIAMS: That was
2 all for test facilities, yes.

3 Q And I suppose that will
4 increase to \$10 million or so before you're finished.

5 A Well, I think the
6 \$700,000 for the Calgary test site, it was suggested
7 that by the time the research work is completed there,
8 that that will go to about a million dollars.

9 That was included in the total of 9 million.
10 The other three test sites are shut down and there
11 is only routine maintenance going on. The present cost
12 of those other sites is minimal, so --

13 Q 9 million is a fair
14 figure then?

15 A Yes sir.

16 Q And I believe that Mr.
17 Genest said back on March 3rd, in his opening statement
18 that the total cost of construction of the pipeline
19 would be about \$7 billion. Is that your understanding
20 of it, Mr. Williams?

21 A Yes sir.

22 Q Well, perhaps you could
23 tell the Inquiry what percentage \$9 million is of
24 \$7 billion.

25 THE COMMISSIONER: I don't
26 think, Mr. Bell, that that's getting us anywhere.
27 We could all work it out. I think even I could figure
28 out what it is, and that's a point you can make in
29 argument if it's vital to the propositions you wish
30 to develop.

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1 MR. BELL: Q Mr. Williams, I'd
2 like to refer you to Exhibit No. 54. It's Section
3 8 of the application, it's tab No. 8.B.1.3 at page
4 25.

5 MR. GENEST: May I have the
6 reference, please?

7 MR. BELL: Yes, it's 8.B.1.3
8 at page 25, under the heading:

9 "Construction studies."

10 There are three short paragraphs here. Perhaps if I
11 just read them, under the heading,

12 "Objectives,"

13 it says:

14 "The main objectives of these studies were
15 to evaluate various methods of excavation
16 in permafrost such as blasting with back-hoe
17 cleanout and the use of ditching machine or
18 ripper in back-hoe to compare and assess
19 methods of clearing by hand or by bulldozer,"
20 and under

21 "Results and application,"

22 it says in the application:

23 "At the Sans Sault test site a ditching machine
24 was used, the results indicated that ditching
25 can be economically accomplished in areas of
26 fine-grained permafrost soils by a suitably
27 designed wheel type ditching machine."

28 And the next paragraph reads:

29 "Blasting and back-hoe ^{excavation} was used
30

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1 successfully at the other two facilities. It
2 was demonstrated that care in spacing and
3 loading of charges can minimize disturbance
4 in the vicinity of the ditch . At Prudhoe
5 Bay a ripper followed by a back-hoe was used
6 successfully for the shallow grade construction.
7 In addition, closely spaced auger holes with
8 blasting between the holes followed by back-hoe
9 cleanout was used."

10 Perhaps just so we'll have an idea of what we're talking
11 about here, could you describe a ditcher, a back-hoe,
12 and a ripper for us, just what they look like and what
13 their main movements are?
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1 A I think in the,
2 yes, in our slide presentation of the Sans Sault I
3 think we saw a picture of a wheel type ditcher. I
4 would think that that would be adequate, is that
5 correct?

6 Q It was the big machine
7 that had a series of scoops on a wheel?

8 A That is correct, yes.
9 A backhoe is a shovel that excavates towards the
10 machine as opposed to a shovel that excavates away
11 from the machine and it is different from a drag line
12 or a clam --

13 Q What is a ripper?

14 A A ripper is an attach-
15 ment to a tractor, a large dozer type tractor that
16 is usually hydraulically attached or fixed so that
17 usually a single or a multiple tooth is forced
18 into the ground and is dragged behind the tractor to --

19 Q It just breaks up the
20 earth then, it does not dig or anything, it does not
21 scoop it out?

22 A That is correct.

23 Q I see. And can you
24 tell me which of these methods will be used to
25 make the trench into which the pipeline will be placed
26 or will they all be used?

27 A We have done an assess-
28 ment on the route. Taking into account the knowledge
29 of the soils that we expect to encounter and the
30 equipment that is available and we expect that a very

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1 large percentage of it can be excavated with a wheel
2 type ditching machine. There certainly are areas
3 that the machine is not capable of providing the
4 ditch required on an economic basis at least and for
5 those areas, like bedrock, well consolidated frozen
6 gravel, and possibly well consolidated frozen sands,
7 that it may be, probably would be more economic to
8 excavate by drilling, blasting, and excavating either
9 with the wheel type ditchers then after blasting or
10 with a backhoe.

11 Q Could you estimate for
12 us what percentage of the line you would require
13 using blasting with some other type of excavation?

14 A Yes, our estimates
15 run between 15 and 20%, may require blasting and
16 machine excavation.

17 Q Can you tell us where
18 abouts on a line those areas are located?

19 A I can give you a rough
20 estimate by location. I have it broken down into
21 three gross areas. Between Richards Island and the
22 Chinchaga River which is in Northern Alberta, about
23 at the southern end of the discontinuous permafrost
24 zone, we expect about 10 to 12% of that section would
25 require blasting. From the Alaskan border to Travail-
26 lant Lake, the number I have is 11 1/2%, there is a
27 variation in there and -- well, you are not interested
28 in the Alaska section.

29 THE COMMISSIONER: What was
30 that river, the Chinchaga?

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1 A The Chinchaga, yes, sir.

2 Q Would you spell it,
3 please? Oh, you do not have it in front of
4 you -- that is all right.

5 A I have the way that I
6 spell it, but I would not guarantee it, sir.
7 I think that it is C.H.I.N.C.H.A.G.A.

8 MR. BELL:

9 Q Now, you gave us
10 percentages along these two different areas, can
11 you be a little more specific about the location of
12 potential blasting areas?

13 A I do not have that with
14 me. I do have it in Calgary. I could bring it
15 back and we do have it on a -- subdivided much finer
16 than that, yes.

17 Q Well, perhaps we could
18 get to that on the construction panel then.

19 THE COMMISSIONER: Well, either
20 Mr. Williams, as a member of this panel or someone
21 on the construction panel should bring that data.

22 MR. GENEST: We will see that
23 that is done, sir.

24 A I would like to say
25 that these numbers that I have given you this morning
26 were based on estimates done a couple of years ago,
27 because it is, of course, an important part of a cost
28 estimate and since that time developments have
29 proceeded with ditching, particularly wheel ditching
30 equipment and we would certainly hope to reduce

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1 those numbers and in fact the work that we have done
2 this past winter with wheel ditchers in a
3 shale pit near Seebe west of Calgary indicates that
4 probably we will have success in this area. We did
5 excavate some very difficult material.

6 Q Your testing of the
7 ditcher is still going on?

8 A Yes, sir, and will
9 right up until construction.

10 Q Well, perhaps just so
11 we can have a little fuller picture about the
12 blasting areas. Could you describe for us just
13 how blasting is done. I am interested in things
14 like how the ground is prepared for it and, the
15 configuration of the charges, if they go off in a
16 sequence; what time of day it is done, what
17 sort of safety measures you use. Can you briefly
18 describe that for us?

19 A Yes, I am certainly
20 not a blasting expert, but I will try to do my
21 best. We have done some minor -- I would emphasize,
22 a very minor amount of research work in blasting in
23 permafrost. Now, there has been a considerable amount
24 of blasting done in rock for pipeline construction.
25 For instance, in Ontario, for the Trans-Canada Pipeline.
26 Hundreds of miles of that line require -- was required
27 -- I am sorry, was in rock and blasting was required
28 to install that pipeline. So the techniques of
29 blasting in rock are pretty well known and so we did
30 a little research in permafrost that did not contain

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1 rock. We did this so that if it turned out that our
2 ditching machine did not do the job we had an
3 alternative method and the work that was done,
4 holes were drilled about to the proposed ditch depth
5 using an air-type drill, a hole about three inches
6 in diameter and explosives put into the holes at
7 various levels in that hole and the spaces filled
8 up with a granular material or spoil that come out
9 of the hole. The drill patterns that we used,
10 varied considerably, but we found that the one
11 we liked best, that gave the best results was about
12 a five-foot square, five dice pattern with a drill
13 hole on each corner of a five-foot square when one
14 in the middle and loading this fairly lightly we
15 found that we could break the material without
16 excessive throw and this is one thing that we are
17 vitally concerned with, we want to avoid throw, we
18 want to have that material available to put back
19 over the pipe.

20 Q What sort of a load
21 would go in each hole?

22 A Oh, I would have to
23 go back to one of the reports. I am sorry -- I really
24 could not answer that sensibly here --

25 Q Now, all the charges
26 would go off at one time, is that what you are
27 saying?

28 A No, you could
29 drill a mile -- say a mile of pipeline ditch and
30 place the charges and delays could be set between the

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1 charges to have them go off in a progression down
2 the ditch line.

3 Q But within the five dice
4 configuration you described, they would all go off
5 at the same time, is that --?

6 A They certainly would
7 within those five holes that we are talking about
8 and of course there are an adjacent five holes.
9 The explosives in the five holes would be simultan-
10 eous, but the next five can be delayed very slightly.

11 Q I suppose when the blast
12 goes off rock is spewed out -- how far would it go
13 and what sort of pattern would it make?

14 A Well, what I was trying
15 to say earlier was that if the charges are set lightly
16 enough to do the job that it can be done with very
17 little throw. I would say much less than five per-
18 cent of the material would be thrown away from the
19 ditch line. It is just a matter of breaking and
20 you get a rise of material over the ditch line
21 rather than throw.

22 MR. SCOTT: Mr. Commissioner,
23 I am just going to rise and ask if my friend was
24 laying a foundation for some geotechnical question?
25 As Mr. Gouge was able to point out to me that it was
26 twelve o'clock and that consequently I did not have
27 to make that observation, if it is your wish as I
28 understand it to adjourn at twelve o'clock, perhaps
29 the matter can be deferred until the next day.

30 Could I take one minute

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1 to put into the record some information that Mr.
2 Genest has provided to me as a result of three questions
3 I asked on March the 17th , which are found in
4 Volume XIX, at pages 2127 and 2128. The response
5 to the first question is divided into two parts,
6 for the prime route in the Yukon and the Northwest
7 Territories a total of 600 miles of route are affected
8 by the Fort Simpson amendment and the cross-delta
9 alternative. 547 miles are not affected. For
10 the interior route in the Yukon and Northwest Terri-
11 tories a total of 236 miles of route are affected
12 by the Fort Simpson amendment, 854 miles are not
13 affected. The cross-delta alternative of course
14 would not be used if the interior route was selected.

15 The answer to question 2
16 is divided into three parts. First, assuming that
17 the cross delta route was selected and the Fort
18 Simpson amendment implemented there would be
19 1,011 miles of route in the Yukon and the North-
20 west Territories. Second, what the prime route as
21 filed, there are 1,147 miles of route in the Yukon and
22 Northwest Territories. Third, with the interior
23 route as filed with the Fort Simpson amendment, there
24 would be about 1,093 miles of route in the Yukon and
25 the Northwest Territories.

26 The third question related
27 to the spacing and location of bore holes and Mr.
28 Genest or I suspect Mr. Williams has in fact prepared
29 a chart and I think the easy way to deal with that is
30 to ask that it be made an exhibit. As Mr. Williams

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1 I am sure will have virtually nothing to do for the
2 next two weeks, I wonder if we could ask him to
3 extend that answer. I think that he has answered
4 the question. The chart refers to drill hole data
5 on the Fort Simpson amendment and the cross delta
6 alternative. I wonder if he could have someone in
7 his office prepare for us what I thought was in fact
8 intended, that is the drill hole data for the balance
9 of the prime route and by that I mean -- I am speaking
10 of the prime route as amended by the cross-delta
11 alternative and the Fort Simpson amendment, that is
12 the balance of, I think 547 odd miles.

1 I will have occassion to remind
2 Mr. Genest, by letter, about his undertaking with
3 respect to the alignment sheets that were provided to
4 the environmentalists. I think sir, that may resolve
5 some of the questions that were asked in the cross
6 examination this morning.

7 I've communicated to you sir,
8 the consensus of counsel that if it is your wish, we
9 should on April the 7th, which is the next formal hearing
10 date, meet from one o'clock p.m. until 6 o'clock p.m.
11 That gives us the same number of hours for that date,
12 that we would have if we met from 2-5 and from 8-10
13 as we did this week. But it was just thought that it
14 would be a better allocation of the time than that
15 arrangement. Then the following Tuesday, April 8th,
16 we will resume at nine o'clock in the morning, if it
17 pleases you?

18 THE COMMISSIONER: All right,
19 then. Yes?

20 MR. GENEST: Perhaps as a
21 last statement, I have this morning distributed, given
22 to the Inquiry, and distributed to my friends, a letter
23 from Mr. Marshall, listing reports that pertain to the
24 Cross Delta Route Alternative. There are seven in
25 number, two of which had been previously listed on lists
26 submitted earlier, lists of documents. I discussed the
27 matter with Mr. Scott of where they should
28 be kept during this two week interval, and subject to
29 your approval and other remarks, it was felt that perhaps
30 to have them stay in Yellowknife, was the best of the

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Government
Publications

MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF AN APPLICATION BY CANADIAN ARCTIC
GAS PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT
BE GRANTED ACROSS CROWN LANDS WITHIN THE YUKON
TERRITORY AND THE NORTHWEST TERRITORIES FOR THE
PURPOSE OF THE PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE
PROPOSED PIPELINE

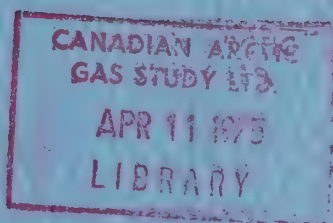
(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.,

April 7, 1975.

PROCEEDINGS AT INQUIRY

VOLUME XXIV



APPEARANCES:

Mr. Ian G. Scott, Q.C. Mr. Stephen T. Goudge, Mr. Alick Ryder and Mr. Ian Roland	for Mackenzie Valley Pipeline Inquiry;
Mr. Pierre Genest, Q.C. Mr. Jack Marshall, Mr. Darryl Carter and Mr. John Steeves	for Canadian Arctic Gas Pipeline Limited;
Mr. Reginald Gibbs, Q.C. Mr. Alan Hollingworth	for Foothills Pipelines Ltd.;
Mr. Russell Anthony, and Prof. Alastair Lucas	for Canadian Arctic Resources Committee;
Mr. Glen W. Bell and Mr. Gerry Sutton	For Northwest Territories Indian Brotherhood and Metis Association of the Northwest Territories;
Miss Lesley Lane	for Inuit Tapirisat of Canada and The Committee for Original Peoples' Entitlement;
Mr. Ron Veale and Mr. Allen Lueck,	for Council for Yukon Indians
Mr. Carson H. Templeton,	for Environmental Pro- tection Board;
Mr. David Reesor,	for Northwest Territories Association of Munici- palities;
Mr. Murray Sigler,	for Northwest Territories Chamber of Commerce.

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CANADIAN ARCTIC
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John Ivor CLARK
Garry Wood HOLLINGSHEAD
Edward Charles McROBERTS
William Alexander SLUSARCHUK
Richard H. COOPER
Guy Leslie WILLIAMS
R.M. HARDY
- Cross-Examination by Mr. Bell (cont'd) 2768
- Cross-Examination by Miss Lane 2778

EXHIBITS:

86 Photographic copies of Professor
Church's slides 2763

Yellowknife, N.W.T.,

April 7, 1975.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. SCOTT: Mr. Commissioner, could I begin by introducing Miss Leslie Lane, who will be appearing in Mr. Bayly's place? Mr. Bayly is engaged for part of this week in a murder trial, I think, in Baffin Island. I'm not quite sure of his role in the trial, but when he returns he will no doubt let us know.

Could I also file as the next exhibit, because it may be useful upon cross-examination, copies of the slides that Professor Church used in his overview evidence which are in this blue folder? The slides have been reduced to photographs and are pasted on cards, and given numbers which correspond, I understand, with the numbers that were given in the transcript of his evidence during the overview. I don't know what exhibit number that will be.

THE SECRETARY: Exhibit 86.

(COPIES OF CHURCH'S SLIDES MARKED EXHIBIT 86)

MR. SCOTT: I should also advise the participants to the Inquiry that on Friday the Government of Canada filed a supplementary list of documents which is in the possession of Mr. Waddell -- the list, that is -- and he will be preparing copies today, I understand, and will make them available upon request to any participant here and failing that, will mail them out to the participants of record at the

1 Inquiry.

2 Now Mr. Commissioner, I
3 understand Miss Lane has something that she wished to
4 raise.

5 MISS LANE: Mr. Commissioner,
6 my submission arises out of a submission by Arctic
7 Gas of some reports that had not previously been made
8 available to the participants. It's in a letter of
9 March 20, 1975, but I notice they submitted a further
10 list of reports which I haven't had time to peruse,
11 but it appears to support the submission I'm going to
12 make.

13 We feel that this submission
14 represents a direct contravention of your preliminary
15 ruling, specifically page 9 of the preliminary ruling
16 on the production of documents. Some of these reports
17 were available as early as June, 1974, and were not
18 available to the participants until March 20, 1975.
19 It makes it very difficult for our participants to
20 prepare any kind of meaningful examination when these
21 reports / ^{appear} on the scene so late in the day, and also
22 some of these reports are to do with the cross-delta
23 route and would have been particularly helpful in the
24 community hearing in Aklavik, which have already been
25 held.

26 Now I would ask for a response
27 from Mr. Genest for Arctic Gas, first are there any
28 more, and perhaps after they've been put on notice --
29 we don't intend to do so now but we may be forced to
30 ask for an adjournment or request an adjournment in

1 order that we be given time to fully assess these
2 reports and be prepared to ask meaningful questions
3 based on them.

4 THE COMMISSIONER: Thank you
5 very much.

6 MR. GENEST: Mr. Commissioner,
7 I appreciate the point made by my learned friend. Our
8 problems in this regard were, of course, pointed out
9 in the arguments that preceded your preliminary
10 rulings. We have, Arctic Gas has a staff of about
11 70 people in the Toronto office; 90 people in the
12 Calgary office; it has a consultant, Northern Engineer-
13 ing Services, with over 100 people; it has another
14 consultant, Norcan with over 100 employees. In
15 addition to all that it has a large number of independ-
16 ent consultants. It is not operating a pipeline, all
17 of these people are daily engaged in producing
18 paper, in producing material, studying the feasibility
19 of this or the optimization of that.

20 Your ruling, sir, required
21 us to file what were called studies and reports, and
22 necessarily require the application of some judgment,
23 otherwise we would quickly fill this whole hotel with
24 documents. Some of these documents appeared on our
25 lists of consultants; some of them, as my friends are
26 aware, we were not able to find. We knew the titles,
27 we knew they had been around some time, we had to
28 search for them. We are doing our very best to comply
29 with these rulings. There will undoubtedly be other
30 reports, we will undoubtedly, with this number of

1 people involved, in really doing nothing but producing
2 paper. That is the end result, they are thinking and
3 producing paper. We will undoubtedly be filing further
4 supplementary lists. As I've said before, if a party
5 is prejudiced, if a party turns up on a report that
6 we have filed late, something that he feels has
7 prejudiced his interests in the cross-examination of
8 an earlier panel or the presentation of some of his
9 evidence, then that party has a remedy and can make a
10 submission to you and demonstrate his prejudice, the
11 prejudice that he has suffered to you, and then you
12 can rule that the cross-examination be re-opened, that
13 the witnesses be recalled.

14 We have a large number of
15 matters to deal with in this Inquiry which are not
16 covered by the late filing of reports, and I'm sure
17 our time can be usefully employed. All I ask is for
18 some understanding of the really gigantic task there
19 is of selecting out of this mass of documents what is
20 a study, what is a report, what is somebody's jottings
21 on the back of an envelope, and to produce something
22 meaningful to this -- and helpful to this Inquiry
23 rather than just a mass of filing documents, of box
24 of files, but we are doing our best in that regard.

1 That is really all I can say
2 about that, sir.

3 MR. BELL: I've just been
4 handed a list of reports by Mr. Carter. It's entitled
5 "Third Supplementary List of Reports" filed by CAG to
6 the Berger Inquiry. It's dated April 3rd, 1975.

7 Just perusing through the list
8 of reports, I see that there are reports/which date as
9 far back as June, 1970, and by far the vast majority
10 of them are dated well before October 31st, 1974. I
11 would just like to remind Mr. Genest, of the assertion
12 by his predecessor, Mr. Goldie of approximately a year
13 ago, If you recall, he said Artic Gas was ready to
14 proceed forthwith at that time, so I think that Miss
15 Lane's remarks are well taken.

16 MR. SCOTT: Mr. Commissioner,
17 as none of my friends are asking for any specific
18 relief at this stage, perhaps that matter can be left
19 with Mr. Genest, appropriately ticked off. I'm delighted
20 that I didn't have the obligation to perform it today,
21 but I may have an opportunity before long. Could we
22 then proceed with the cross-examination of this panel,
23 and I think that Mr. Bell was in the midst of his
24 cross-examination.

25 MR. GENEST: Before we do that,
26 I just wanted to say that I wouldn't feel comfortable
27 if I didn't have every morning on my doorstep, the daily
28 blast. We had a number of undertakings sir, that we
29 had agreed to comply with. It was my intention to sort
30 of present them as a package this morning, but my plane

1 from Edmonton was delayed for two hours and I haven't
2 had time to organize these.

3 MR. SCOTT: It was no doubt
4 delayed to get your documents on board?

5 MR. GENEST: No. I wonder if
6 my friends will allow me the evening to get these
7 together so that we can present them of a piece, in an
8 organized way, and if anybody wants to cross-examine
9 on something that arises out of the production of these
10 things that were asked for we can do so tomorrow.

11 MR. SCOTT: I agree with that.

12 JOHN IVOR CLARK
13 GARRY WOOD HOLLINGSHEAD
14 EDWARD CHARLES McROBERTS
15 WILLIAM ALEXANDER SLUSARCHUK
16 NORMAN REUBEN MORGENSTERN
17 RICHARD H. COOPER
18 R.M. HARDY
19 GUY LESLIE WILLIAMS, resumed:

20 CROSS-EXAMINATION BY MR. BELL CONTINUED:

21 Q Well, I just have a few
22 brief questions. I would like to address my first
23 question to Dr. Clark.

24 I think from what we've heard
25 of geotechnical problems over the last few weeks, it
26 probably would be safe to say that geotechnical problems
27 add to the cost of the pipeline. Is that a fair
28 statement?

29 WITNESS CLARK:

30 A I don't believe --

Q In so far that if they
weren't geotechnical problems you wouldn't have to
allocate resources to solving them, to responding to

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Bell

1
2 them?

3 A If you are suggesting
4 that the stabilization of a slope costs money, that is
5 quite correct.

6 Q Would you say that as
7 a general rule, a pipeline designer would want to keep
8 the cost of the line to a minimum, and would therefore
9 try to build it in such a way that geotechnical problems
10 would also be minimized?

11 A Well, I would see that
12 what you call a geotechnical problem, is part of the
13 physical environment and we would want to cause as
14 least a disturbance to the physical environment as
15 possible, yes.

16 Q So far the geotechnical
17 concerns, the geotechnical problems, if I can use that
18 phrase, which we have been discussing have been mainly
19 associated with a buried chilled pipe mode of construction.
20 I was wondering if we could discuss for a moment
21 in general terms. The pile support mode of construction,
22 which I believe is an above ground method of construction
23 where the pipe is place on piles which have been sunk
24 in the ground. I would like to ask you if it would
25 be fair to say that most of the geotechnical problems
26 which we have been discussing, could be greatly reduced
27 or even eliminated, if the pile support method of
28 construction were used?

29 A Many of the geotechnical
30 concerns would be reduced. You would also introduce

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Bell

1
2 other types of geotechnical concerns. There is a, in
3 this orange book, I forget the Exhibit number, but there
4 is a response to a question relating to different modes
5 of construction, and we point out there, that from the
6 point of view of slope stability for instance, there
7 are many cases where there would be less concern if
8 we put it on piles with respect to the terrain stability.
9 We also point out however, that the overall benefit
10 is to bury it, and those problems that relate to
11 terrain stability can be handled in every case.

12 Q The overall benefit would
13 include factors that weren't necessarily geotechnical
14 considerations. Is that what --

15 A That's correct.

16 Q Perhaps it would be
17 helpful if I could identify some of the geotechnical
18 problems, apart from slope stability, which would be
19 reduced or eliminated if the pile support method were
20 employed. I have drawn up a rough list here of some
21 of the problems that I have been able to identify and
22 I would like ask you if you would give me your opinion
23 as to whether these problems would be reduced or
24 eliminated if the pile support method were used. The
25 first one I have here is, problems relating to frost
26 heave and frost bulb.

27 A There would be no frost
28 heave of an elevated pipe, other than that associated
29 with the natural freezing and thawing of the ground
30 as it affects the piles.

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Bell

Q What about erosion problems?

A There would still be a

necessity to carry surface water across the right-of-way
with an elevated pipeline.

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Bell

Q Would it present as great
a problem as having a buried pipeline?

A Oh --

Q Would the problems be the
same, is that what you're saying?

A -- no, I'm not saying
they would be the same. They would be different. We
of course wouldn't have a berm to deal with or a spoil
mound. We would have tiered areas, runoff character-
istics of a cleared area that are different than they
were before that area was cleared. Sorry.

Q Well, with the buried
pipeline method you have cleared area plus the spoil
mound.

A That's correct, yes.

THE COMMISSIONER: And if the
pipeline were on piles from the point of view of examining
the problem of
erosion you would have your 120-foot cleared right-of-
way.

A I'm not certain of what
the right-of-way would be for an elevated pipeline.
Yes, there would be a cleared area of the right-of-
way.

MR. BELL: Q And what about
permafrost disturbance and problems associated with
a chilled pipeline?

A Well, with the elevated
line in the continuous permafrost zone there would
still be the thermal disturbance associated with

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Bell

clearing the right-of-way. In the discontinuous permafrost zone, of course, this can cause the permafrost to completely disappear with time, just surface changes whereas the chilled line would very likely not allow that to occur, and in the discontinuous zone of course the elevated line would not freeze previously on frozen soils.

Q And of course the need to dig a ditch and the equipment that would have to be developed to permit you to do that would not be a problem at all with the pile support method.

A With an elevated line you wouldn't have a ditch, that would be replaced by piling equipment, large drills and pile-driving equipment.

Q So you could eliminate the ditcher and probably much of the blasting that would be required.

A I'm not sure of that. In the elevated line you would have to have supports, nonetheless. It would depend ^{whether} / you buried where there was rock, or you elevated. Assuming it was elevated you nevertheless would have to construct supports and there would be blasting associated with that.

Q There wouldn't be as much?

A Not as much, no.

Q And what about problems associated with an empty pipe during the period between

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Bell

installation and startup, to the extent that there are geotechnical problems associated with that. They would also be reduced or eliminated with the pile support method, is that correct?

A Our concern during that period is largely related to the backfill, the stability of the backfill.

Q M-hm.

A And of course there would be no backfill for an elevated line.

Q What about sensitivity of a pile supported pipeline to seismic disturbances?

A It would be much greater, ^{it would be} much greater for the pile-supported line than for the buried line.

Q And what about sensitivity to thermo-karst subsidence?

A That's quite difficult to assess except on a site specific basis. I don't think one could generalize and say it would be a great deal less sensitive. Certainly to some extent the elevated line would probably be less sensitive to thermo-karst but the buried line will inhibit the development of thermo-karst in some areas, localized areas, where it's under the zone of influence of the chilled pipeline.

Q And what about problems associated with hydraulic testing of the pipe, to the extent that there are any problems?

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Bell

A I would suggest that that question would be more appropriately put to the testing panel that will be appearing next.

Q O.K. Well, apart from problems associated with river crossings, have I left anything out that you think should be added?

A Well, I could review the comparison here, but it is table 24-1 in this book where we try to --

Q That's Exhibit 70, I think.

A Yes, we try to give a comparison of the advantages and disadvantages.

Q What page is that again?

MR. GENEST: 24, sir. There are no pages, unfortunately.

A On the bottom of the pages there, each question number appears first, and the page number second. This table follows page 24-2.

MR. BELL: Q Perhaps it would help if I just read this. You have over in the left-hand column the construction load, I'll go down to pile support; and you list two advantages to pile support, one being no ditch required and the other being less effected by slope instability, and I assume that insofar as our discussion here today, if it had revealed any other advantages they would also be listed there, I assume.

A It's a matter of degree,

Clark, Hollingshead, McRoberts,
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Hardy, Williams
Cross-exam by Bell

yes.

Q The disadvantages, there
are five of them, I see:

"Greater environmental impact,

Pipe insulation required,

Greater potential for metallurgical problems due
to extreme ambient temperatures;

Fourth, thermo-piles required in some areas,

And fifth, buried sections required to permit
wildlife migration."

Now which of those relate
to geotechnical aspects of this question?

A Well, the buried sections
would require geotechnical considerations of the
terrain where they're buried. The thermal piles would
be -- involve the geotechnical design. The metallurgy
and the insulation are not related to geotechnical but
or course the environmental impact, includes physical
environment such as the terrain, so the first and last
two pertain to geotechnical.

THE COMMISSIONER: You've
compared three modes of construction at 24-1,

"burial and chilling,"
the mode you have adopted,

"berm and pile support."

A Yes sir. That was
what the question asked for --

Q Yes, I'm sure that
it did ask for. I just --

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Bell

A The berm, perhaps I should clarify, is where the pipe would be placed on the ground or in a very shallow ditch, and earth would be mounded up over it.

MR. BELL: Q Well, from a strictly geotechnical point of view then, and recognizing that there may well be other factors which led to the choice of the buried chilled pipe mode of construction, the applicant seems to have chosen a method which results in more geotechnical problems, or at least problems which would require more geotechnical input, if I can say that.

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Bell
Cross-Exam by Lane

A The applicant has stressed the importance of the least environmental impact in that sense that the geotechnical aspects can be designed for.

Q This, of course, would increase the cost to the applicant in building the line.

A The buried line is not more costly than the elevated line.

Q But that's because of factors other than geotechnical factors.

A Of the piling, for instance, would be a major factor of insulation and so on.

MR. BELL: Thank you very much. I have no further questions.

CROSS-EXAMINATION BY MISS LANE:

Q My first question is directed to Dr. Williams.

A Mr. Williams.

Q Mister? I'm not even sure which one you are. O.K. Was the decision to loop the line, was that made before or after the primary route was selected?

MR. GENEST: Well, I'm sorry to interfere right at the beginning of this cross-examination, but the question implied that there has been a decision to loop, and that's certainly not my understanding of the evidence.

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
CrossExam by Lane

MISS LANE: Well, perhaps I can get at this another way then.

Q The original application the first volume, of Volume 8, 8-B, this comes out of the decision to change from the 48-inch pipe for the upper Y of the pipeline, that's the lines from Prudhoe Bay and Richardson Island to Travaillant Junction. Originally projected, you were going to use 48-inch pipe, and part of the reasoning given was that it was less costly and / ^{there} would be less likelihood of having to loop the pipe, to accommodate greater ^{about} gas volumes that would necessarily come after the Fifth year projected gas volumes. Well, in your amendment you're now going to use a 42-inch pipe for that area, I understand. I'm just wondering, will you have to loop the pipe?

A I don't think that is an amendment. I think that is an alternative that is being considered. It is not -- I don't think it has been submitted as an amendment. That is one of several alternatives that are under consideration.

Q So there's no definite decision been made to use a 42-inch pipe for the upper Y of the pipeline?

A Well, I can't speak for the policy of the company, but to my knowledge that decision has not been made.

MR. GENEST : Perhaps I can be of assistance in that matter, sir. My instructions

Clark, Hollingshead, McRoberts,
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Hardy, Williams
Cross-Exam by Lane

1 as gathered since we last met here are that it is
2 unlikely that a decision on whether to adopt a 42-inch
3 alternative for the Prudhoe Bay leg will be made hope-
4 fully -- I shouldn't say "hopefully" -- will be made
5 for some time. That decision strictly depends upon the
6 rate of discovery of gas at Prudhoe Bay. Our present
7 projections indicate, I am instructed, that if the
8 rate of discovery proceeds at the rate which we now
9 project, the 48-inch line is going to be the line that
10 is going to be used. However, if we are disappointed
11 or if these projections do not turn out, then a 42-inch
12 line may have to be constructed. But it is not likely
13 that this decision -- that we will be faced with this
14 decision for quite some considerable time. At least
15 perhaps up to the time of construction.

16 That is why we are presenting
17 it to this Inquiry as an alternative only; we are not
18 in a position to make any decisions. Those are my
19 instructions, Mr. Commissioner.

20 MISS LANE: If you were to
21 loop the line, if the decision at some future date was
22 made to loop the line, would it be made solely on
23 geotechnical grounds, the decision be made solely on
24 geotechnical grounds?

25 A I wouldn't think so.

26 Q What kind of considera-
27 tions would go in, as Mr. Genest has said, totally
28 on how much gas is available whether you need to run it
29 or not? In other words, is your decision to loop the
30 line going to basically be based on how much gas the

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Lane

area produces?

A I would think that would
be correct, supply and demand, yes.

Q Thank you. I'll refer
you to page 1 of 8-B-1-2. I'm referring to:

"Expanding a pipeline system in the Arctic to
accommodate the potential volume increases through
incremental looping is expensive because of
high mobilization and construction costs. The
installation of --"

A I'm sorry, I didn't get
the location.

Q The paragraph is the
third one down.

A This is 8-B-1-2?

Q Yes, I'm sorry, yes
B-1. I believe it would be called paragraph 4.

A Does that begin:

"Expanding the pipeline system in the Arctic?"

Q That's correct.

A Thank you.

THE COMMISSIONER: Excuse me,
this is Volume 8?

MISS LANE: Yes.

THE COMMISSIONER: Exhibit 54,
I have it, 8, tab B --

MR. GENEST: 8-B,

"Design and capacity"
tab 2.

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Hardy, Williams
Cross-Exam by Lane.

THE COMMISSIONER: White tab

2?

MR. GENEST: White tab 2,

page 1.

THE COMMISSIONER: Yes, I have

it. Thank you.

MISS LANE: Referring to the

sentence:

"The installation of excess initial capacity is also desirable from the standpoint of environmental impact because gas volume increases can be accommodated with minimum disturbance of the environment by installing compressor equipment at sites along the line."

Now, presumably then if you don't -- what environmental impact is there going to be resulting from looping the line?

A It will be quite similar to the initial installation, put another line beside it, the effect would be very similar to the initial installation.

Q So whatever environmental --

A It would be mainly associated with the pipeline itself. The compressor station pads would be in there initially and that disturbance wouldn't occur in the second go, the second line, the disturbance at compressor station pads but along the right-of-way, installing a second

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Lane

line adjacent to the first line, the environmental
disturbance would be very similar.

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Coopers
Hardy, Williams

Cross Examination by Lane

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Q So, in other words, aside from the environmental damage that would be done by installing a compressor station, you would have a double dose, you would get the same thing over again?

A As far as the pipeline between the stations are concerned that would be fairly close to correct I think.

Q How far are the loops, or would the second line be?

A Oh, on the prairie they vary from ten to thirty feet. Of course we haven't studied looping in this case and there is no decision with respect to this particular project except what we have filed for the Cross Delta proposal.

Q If you choose to use the 42 inch pipe, is there going to be a greater likelihood that you're going to have to loop the pipe?

A It would depend as Mr. Genest said, on the supply and of course the demand at the other end.

Q Are you going to reach the necessity faster with a 42 inch pipe than a 48 inch pipe, of having extra pipe? The 48 inch pipe, you said actually in your preliminaries, accommodates more gas?

A Certainly.

Q So it would seem to me then sooner, you would reach the need for the looping faster, given a great amount of gas in that area, than you would with the 42 inch pipe?

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Lane

A Yes.

Q Thank you.

Now, I would like to ask
time
you another question, this/about the pipe. You refer
to, at the very bottom of that same page, item C,"
pipe of the required diameter, wall thickness, and
grade, shouldbe commercially,available, the required
quantities at this time." Where will the pipe come
from?

A I think the next panel
will be better qualified to answer.

MR. GENEST: Excuse me, Miss
Lane. If that is just a casual question, it's one thing,
but I would oppose sir, any attempt to get into any
detailed examination of Canadian content and sources of
manufacture, as being outside the terms ofreference
of this Inquiry and within the province of the National
Energy Board. I'm saying this not so much for Mr.--for
Miss Lanes' benefit, but I see Mr. Gibbs hiding in the
bushes on this one.

THE COMMISSIONER: I don't
see him. I see Mr. Hollignsworth. Well, you're not
raising that at this point are you Miss Lane?

MISS LANE: No, Mr. Commissioner.

THE COMMISSIONER: Mr. Gibbs
and you can fight about that when he raises it.

MR. GENEST: I thought I would
give warning, sir.

MISS LANE:

Q Basically, the latter part

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams

Cross Examination by Lane

1 of this question is, has the pipe been ordered? Obviously
2 if you hadn't made the decision as to which pipe to use,
3 I guess not, eh?

4 WITNESS WILLIAMS:

5 A Certainly not to my
6 knowledge.

7 Q Does anybody else on the
8 panel know if they have ordered the pipe? Okay.

9 MR. GENEST: I think Mr. HORTY
10 should answer that question sir.

11 THE COMMISSIONER: Put it on
12 the list.

13 MR. GENEST: We have got a
14 bag for him.

15 Miss LANE:

16 Q This question is just a
17 general question to anybody of the panel. Regards
18 compressor stations. Would it remain critical where
19 you place the station if you used more compressor
20 stations and smaller compressor stations?

21 WITNESS WILLIAMS.

22 A Again, I think this would
23 be better for the next panel, who are experts in
24 compressors and stations.

25 Q Well, your particular
26 part of this application, page 8B12, page 2, goes into
27 a fairly lengthy discussion of why you need to have
28 larger compressor stations.

29 MR. GENEST: I respectfully
30 point out that this whole section of the application

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Lane

1
2 is really being sponsored or spoken to by the next panel.
3 I'm sorry.

4 MS. LANE: Alright. So that's
5 to be deferred to the construction stage as well?

6 MR. GENEST: No, there is --
7 the next panel will be the metallurgical panel who are
8 dealing with the design of the pipeline and the stress
9 analysis and how far the compressor stations must be
10 and all of the engineering considerations that go into
11 that.

12 MS. LANE: Well perhaps they
13 can answer this question.

14 Q Why are unmanned compressor
15 stations desirable?

16 WITNESS WILLIAMS: Again I
17 think that should go to the next panel.

18 THE COMMISSIONER: Miss Lane
19 it isn't up to the witnesses to determine that a matter
20 should go to the next panel, although it seems logical
21 at each of these matters that have arisen that it should.
22 But don't you feel that just because they say it should
23 go to the next panel, ^{that} /it ought to. If you want to
24 persist, you carry on, and we'll deal with it, But I
25 must say that so far I think the panelists were right on
26 suggesting that we consider it when the next panel comes,
27 which will deal with the design of the pipe as I understand
28 it.

29 MS. LANE: I have been advised
30 that some of these questions may be better deferred, so,

Clark, Hollingshead, MCRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams

Cross Examination by Lane

1 in this particular area, so unless you feel you can
2 answer the question, in this particular area I'll
3 wait and we'll ask them later.

4 Q I'll try a different area.

5 This question is with regard to the surcharging of the pipe,
6 and I would address it to Dr. Hollingshead.

7 WITNESS CLARK: I think that
8 relates to frost heave ma'am, and it would be Dr.
9 Slusarchuk that spoke to that earlier on in direct
10 evidence.

11 Q Could I try Dr. Hollingshead
12 first with the question, and then if he can't answer
13 it we can go on to Dr. Slusarchuk?

14 A Certainly.

15 Q When you surcharge the
16 pipe in the form of berms, I understand that in the
17 past you have been talking a lot about the formation of
18 the frost bulb. Is it true that frost heave, although
19 you may counteract it with a berm, can occur in soil
20 away from the line of the pipe but on the outer
21 edges of the frost bulb? Can heaving, frost heave
22 happen there?

23 WITNESS HOLLINGSHEAD: Respectfully
24 I really think you would probably get a better answer
25 from Dr. Slusarchuk.

26 Q All right, where is Dr.
27 Slusarchuk?

28 WITNESS SLUSARCHUK: I'm Dr.
29 Slusarchuk, Miss Lane.

30 You can get frost heaving

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Lane

1 wherever you, wherever you're freezing the ground, the
2 unfrozen ground. Around the cold pipe you freeze
3 sort of a bulb, a circular area around the pipe and
4 anywheres around that area you can get frost heaving.

5 Q So on the outer edges you
6 could get it? Away from the line of the pipe? Okay,
7 the pipe's going here and you have frost bulb around it
8 and you--

9 A You've got a pipe about
10 4 feet wide, and your frost bulb out to the edge of
11 that might be another 3, 4, 5 or 10 feet depending on
12 how long its' been in operation, and if you're talking
13 about that 2, 3, 4 or 10 feet away from the pipe, that's
14 correct, you could get frost heave in that location.

15 Q How far out could the
16 bulb go on either side of the pipe?

17 A Well, this depends a
18 little bit on the temperature that the pipe is operated
19 at and the temperature of the ground, for example if it's
20 warmer in the more southerly area than, say around the
21 Yellowknife area, for example compared to Norman Wells
22 area.

23 Q Maximum.

24 A But in general, it might
25 go out 20 feet.

26 Q On either side?

27 A Yes. 10, 15, 20 feet, I
28 can't-- I could refer you to some drawings, some figures
29 that we've prepared and presented in response to some
30 of the government questions. And also to one of the

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Lane

1
2 figures in the actual Exhibit itself. I could refer
3 you to that figure if you would like to have a look at
4 it?

5 Q I would just like to talk
6 about your 40 foot range on either side. You say that
7 would be the maximum over a 60 year period of the life
8 of the pipeline?

9 A Yes, I don't think it
10 would get much wider than that.

11 Q Have you considered what
12 problems this might cause to adjacent corridor facilities?
13 For example, if you had a highway or a railway in the
14 same corridor as the pipeline, have you considered that
15 at all?

16 A Are you -- I haven't
17 considered it. No I haven't. Are you suggesting --

18 Q Has anyone considered it?

19 WITNESS CLARK: The extent
20 of the frost bulb wouldn't even come close to reaching
21 the pipeline right-of-way, so you would assume that--

22 Q I'm sorry, I didn't hear
23 you?

24 A The extent of that frost
25 bulb wouldn't come close to the edge of the pipeline
26 right-of-way.

27 Q So, it would be contained
28 totally within the right-of-way?

29 A Well within that, yes.

30 Q Well, how about if you

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Lane

1
2 looped the pipe? And you have another pipe running
3 alongside it, I believe. Would there be any chance of
4 a frost heave associated with the frost bulb around the
5 original pipe interfering with the second pipeline, the
6 second loop?

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2 A Not with the right-of-
3 way and I think there was a question put to the first
4 panel asking how much increase in right-of-way there
5 would be in the extent of looping, and an estimate of
6 20 or 30 feet was given. So I couldn't see any situa-
7 tion where a frost bulb would extend beyond the bound-
8 aries of the right-of-way.

9 Q Would this problem be
10 part of the reason why you don't intend to come within
11 more than 1,000 feet of the Mackenzie -- the proposed
12 Mackenzie Highway?

13 A No, that would have no
14 bearing.

15 Q None at all?

16 A No.

17 Q What is the real reason
18 then, would it be icings or --

19 A No, I don't believe it's
20 for geotechnical reasons.

21 Q It's not for geotechni-
22 cal reasons; do you have any idea what the real rea-
23 sons are?

24 A Well...

25 WITNESS MORGENSTERN: Oh,
26 the security, the more activity there is the area,
27 the more hazard there is to the line. In addition,
28 there probably will be some future development along
29 the highway. We would like to stay away from that
30 potential future development.

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Lane

1
2 Q This next question con-
3 cerns surcharging, and the overburden mound. Over
4 what length of the pipeline is it anticipated that
5 you would use this form of surcharging? I take it
6 this is a very large pyramid type of affair. About
7 how much of the pipeline would have this kind of
8 surcharging?

9 WITNESS SLUSARCHUK: Some-
10 where in the neighborhood of about -- there is a
11 potential for frost heave problems, i.e. unfrozen
12 ground, for about 200 miles along the pipeline
13 route. How much of that ground would actually require
14 a surcharge on it, hasn't actually been determined.

15 Q You haven't determined.
16 You wouldn't -- do you know at this point how much
17 would be 20 feet high or more?

18 A How much would be 20
19 feet high? I don't think any would be 20 feet high.

20 Q None would be 20 feet?

21 A No, ma'am.

22 Q How high -- what would
23 the ultimate height be, in your estimation?

24 A We have given an
25 example that five feet might be an average, an upper
26 average height.

27 Q It would never get any
28 higher than that?

29 A That's the berm we're
30 talking about, yes.

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
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Cross-Exam by Lane

have

You see, we / two options,
you can -- to get the additional stress on the frost
bulb you can bury the pipe deeper, or you can apply
the surcharge berm to the surface and it's a combina-
tion of the two that we would try to use, you see, and
--

Q I'm sorry to interrupt
you. Could you start again with that explanation?

A Yes, the idea of sur-
charging is to increase the stress on the frost bulb,
and therefore it reduces the rate of heave that's going
on, and in order to do that we have two very easy
alternatives:

(1) is to bury the pipe deeper because the pipe is
buried deeper, it has to lift more soil above it
as it starts to freeze;

(2) the other way is to get -- to surcharge the surface
over top of the frost bulb in order to get the addi-
tional effect of stress on it.

Q And you said that
approximately 200 miles is a potential for building
this upper --

A There is approximately
200 miles of unfrozen ground, yes.

Q -- where you would have
to use this kind -- the second of the alternatives, of
keeping the pipe down.

A No, ma'am. We haven't
decided how many miles we're going to have to surcharge.

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2 Of that 200 miles, there are 200 miles that are
3 unfrozen and we can use the combination of --

4 Q Oh, I understand, where
5 there is a potential problem where you ^{would} use either one
6 or the other of those methods you described to me.

7 A That's right, or both
8 in combination.

9 Q If you had a maximum
10 height of five feet for this berm, how wide is it
11 at the base of the triangle?

12 A It would probably be in
13 excess of 50 feet across the base.

14 Q Across the base, 50 feet.
15 Where do you anticipate getting the fill to build the
16 berm?

17 A From borrow areas along-
18 side the right-of-way, or from designated borrow
19 areas.

20 Q The berm itself would
21 take up approximately the 50 feet of the right-of-
22 way.

23 A That would be an outside
24 maximum.

25 Q O.K.

26 A Generally it wouldn't be
27 that wide.

28 Q Have you had occasion
29 to determine whether migrating animals are going to
30 be required to detour because of the berm?

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

A I have not, ma'am.

Q Has anyone on the panel?

Has that been a consideration at all?

WITNESS CLARK: That would have to be considered on a site specific basis when we had finally determined where the berm was going to go, but perhaps to put it in perspective, It's not a triangle that we're talking about, it's a low mound that might be 50 feet wide, that's much less than the width of this room, rising up with about three to four to one slopes fairly flat slopes, levelling out, flat across the top, and then falling on the other side so it's not a triangular shape. But that --

Q Would you be using -- I understand gabions to be a wire mesh full of junk that you use in building these berms in for wading and that sort of thing. Am I correct in understanding --

A The gabion is a wire mesh, it's a box shape or takes several configurations but it's filled generally with broken rock or gravel.

Q Are you going to -- do you anticipate that you would use these in building the berms?

A No, we wouldn't.

Q You wouldn't use those?

A No, we showed an example of where a gabion might possibly be used at a berm break to protect for erosion at a specific spot, but it wouldn't be used to construct the general berm.

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2 Q But they could eventually
3 become part of a berm, a gabion?

4 A The gabion that would
5 be used at a berm break would be the -- about 12 feet
6 wide, perhaps, and the width of the berms.

7 Q Where ^{else}/do you use them?

8 A They are used at -- for
9 river training works, commonly in practice that's the
10 usual application. It's an erosion control device.

11 Q Well, have you considered
12 where animals such as caribou could be hurt crossing
13 them?

14 A We have discussed the
15 gabion and illustrated it to our wildlife consultants
16 and I don't ever recall anyone expressing any concern
17 to us when it was described as to how it would
18 operate.

19 Q So you did consult with
20 environmentalists or caribou people?

21 A At joint meetings there
22 were caribou people there that we illustrated the types
23 of erosion control measures that we illustrated here
24 last session.

25 Q How big would these
26 wire mesh screens be?

27 A They would be of a chicken
28 wire size.

29 Q I couldn't put my fist
30 through one of the holes?

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane.

A No.

Witness Hardy: They vary
Witness Clark:
The types that we would use would be -- we'd use it
for instance when there was a very small amount of
rock or gravel available, and we would construct a
relatively thin mat. The box in this case would be
about 12 feet wide and three to six inches thick, and
it would probably be used only where there was poor
or no gravel. Our preferred method to control flow
across the berm breaks would be gravel.

Q Have you considered that
an animal could stick its foot in this kind of thing?

A I recall a discussion
with one of the environmental consultants where he
asked us the size, and we said it would be a chicken
wire size, and he expressed no concern of an animal
getting tangled up in it. There is no point now where
I can say we've used^a gabion. It would be an option
and if in the development of our final designs there
was any concern with the gabion, we're not dependent on
it at all. We could use gravel simply by bringing more in.

Q There are alternatives
to the gabion?

A Several alternatives,
yes.

Q I'm not sure how to
phrase this next question but I'll -- I understand
that Dr. Hollingshead in the past stated that he didn't
anticipate that gravel would be borrowed from stream
beds. Is that correct?

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

WITNESS HOLLINGSHEAD: I

don't think so.

Q I was also led to believe
that Dr. Cooper, from his facial expression at the time,
didn't appear to agree, so I'm going to ask for quali-
fication from Dr. Cooper. Do you agree with Dr. Hollings-
head that there will be no borrowing from the stream
beds?

WITNESS COOPER: Well, I'm not
sure that I understand the answer. Did you mean you
didn't think there would be any gravel borrowing from
stream beds, or that you didn't think you said that?

WITNESS HOLLINGSHEAD: I don't
think that we ever implied that there wouldn't be
borrowing from the streams. Now --

MR. GENEST: That means would
not be?

THE COMMISSIONER: Never did
imply there would not be, is that where we are at?

(LAUGHTER)

WITNESS HOLLINGSHEAD: What
was I supposed to have said again?

MISS LANE: Q You were
supposed to have said that you did not anticipate that
gravel would be borrowed from stream beds; and Dr.
Cooper was supposed to have looked as though he
didn't agree, and I'm now asking if he did or did not
agree.

MR. GENEST: We should put Mr.

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2 Bayly on the witness stand. Does my learned friend have
3 a transcript reference?

4 WITNESS HOLLINGSHEAD: Well,
5 I have a little trouble with the question. But per-
6 haps if I could just say that I would not anticipate
7 that we would borrow gravel from great depths within
8 a stream bed, that that is the channel itself. In
9 other words, the actual bed level of a channel of say
10 a braided stream will not be lowered or degraded
11 significantly by borrow operations. You can ask Dr.
12 Cooper if he would agree with that. I would hope that
13 he would.

14
15
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Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Lane

1
2 WITNESS COOPER: We are in
3
4 total agreement on that.

5 MISS LANE: You might take
6 them from say the bank of the river or --

7 WITNESS COOPER: It's possible
8 may be borrow
9 that there/ operations from bars or higher elevations
10 within a so-called active flood plain, yes, but the
11 ultimate lower elevation of that borrow operation
12 should not extend significantly below the stream bed
13 level.

14 Q I'm not sure that I
15 understand what "higher elevations" means in the
16 active stream ...active river plain?

17 A Well, within a terrain
18 unit that has been referred to as an active flood
19 plain there are stream channels and there are also
20 let us say terraces, gravel bars, areas of higher
21 elevation, that is on either side of the channels
22 themselves. Now it's possible that there may be
23 borrow pits located in those higher -- the terraces
24 and the bars, but the depth to which the mining would
25 be permitted --

26 Q Would not go --

27 A -- should not be
28 significantly lower than the bed elevation of the
29 active channel, of the sub-channel itself.

30 Q Significantly lower?

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2 A Well, something -- I
3 think the ones that we've shown in drawings could be
4 six inches or a foot possibly below the bed level, but
5 they should not go much below that.

6 Q Would these second type
7 of borrowings that you're referring to, would they be
8 in the Williams Lake River or the Firth River? Are
9 either of those considered as areas where you might
10 borrow from the --

11 A I'm not --

12 Q the part of a river plain
13 that you would borrow from?

14 A I'm not aware of the
15 potential borrow site locations, I'm not familiar with
16 the actual locations that have been proposed. I'm not
17 familiar with the first river that you mentioned.

18 Q Well, actually it's just
19 a name to me.

20 A Yes, the Firth is the
21 sort of stream that one might anticipate a borrow
22 operation.

23 Q O.K. For ^{snow} / road construc-
24 tion over wide areas, are you anticipating the use
25 of heavy equipment to collect the snow?

26 WITNESS WILLIAMS: Is this
27 along the right-of-way or is this the suggested snow
28 borrow from lakes that we've talked about in response
29 to questions? In the early part of the season before
30 a snow road is constructed, certainly preparation
will be done with lighter soft track equipment in the

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2 initial stage. I don't know if that answers your
3 question.

4 Q Do you anticipate using
5 heavy equipment at any stage?

6 A Certainly there will be
7 heavy equipment used on the snow road once it's
8 constructed.

9 Q Can you describe the
10 machinery? I'm talking about collecting snow to
11 use to build a snow road. You wouldn't ever use heavy
12 equipment ^{to collect snow} / to build snow roads?

13 A Yes, we'd have a rologon
14 patrol type scrapers on -- conceivably on lakes
15 harvesting snow off of shallow lakes. Trucks or
16 soft track terrain vehicles hauling snow with sleds or
17 with rubber-tired equipment, depending on the situa-
18 tion at the time. Certainly there could be some
19 hard-tracked tractors used if conditions were suitable.

20 Q What about snow-making
21 machines, do you use those?

22 A Yes, we have that in our
23 plan to manufacture snow, that is very light equipment,
24 per se.

25 Q Could you describe a
26 snow-making machine for me, how do they --

27 A The type of equipment
28 we're thinking of is similar to what you would see on
29 a ski hill in southern climates it requires an air
30 compressor and a water pump that forces an air-water

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Lane

1
2 mixture through a nozzle into a fine spray, and it
3 forms snow a few feet beyond the nozzle. Now this equip-
4 ment has to be transported along the right-of-way and
5 we are planning to use either the large rubber-wheeled
6 type vehicles or soft-tracked vehicles -- rologons, if
7 that is necessary, that type of equipment -- in the
8 initial stages until there is sufficient snow thickness
9 to work on with other equipment.

10 Q When you're building a
11 snow road, do you -- obviously the problem is that you
12 don't want to use heavy equipment because it will
13 leave ruts in the ground when you're building it, that
14 don't --

15 A Not necessarily. A
16 heavy track vehicle has a fairly low bearing pressure
17 as compared to a wheeled vehicle, for instance an
18 automobile which has a fairly high pounds per square
19 inch bearing on the surface, when you compare it to
20 a much heavier equipment, but you have more surface
21 area bearing, so that the pounds per square inch of
22 bearing on the surface depends on the track or the
23 wheel that the equipment is mounted on.

24 Q Well, when you start
25 -- your reason for using light equipment is to avoid
26 damage to the terrain underneath where you're going to
27 be building the snow road.

28 A That is correct. That is
29 the intention initially, to get started.

30 Q O.K., when you're bringing

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Lane

1
2 the snow to it, you're not anticipating using equipment,
3 heavy equipment such that would cause damage to the
4 terrain, is that what you're saying?

5 A Well, there are three
6 possibilities here. Say you had an early winter of
7 very light snowfall --

8 Q M-hm.

9 A -- and to get started you
10 had to manufacture snow, then you would have your
11 manufacturing equipment near a source of water and
12 build a snow road from the source of water to where
13 you wanted your snow road.

14 Q So you build a snow road
15 to get to a snow road?

16 A To get to the right-of-
17 way.

18 Q O.K., and once you've
19 got a little bit of the snow road, do you drive heavy
20 equipment over that part of the snow road to dump
21 snow to build the rest of it?

22 A That could be done, yes.

23 Q And on that portion you
24 would use heavy equipment that in other circumstances
25 if it weren't on a snow road would damage the environ-
26 ment, or damage the terrain underneath the snow road.
27 I'm not sure if that's clear

28 A If you don't have
29 sufficient thickness of snow the potential for damage
30 to the terrain is certainly there. If you don't have

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2 the proper equipment, yes.

3 Q Once you've got a base
4 to run heavy equipment on, you will start using it,
5 the heavy equipment?

6 A That would be the intent,
7 yes.

8 Q Do you anticipate frozen
9 streams will be used for ice roads?

10 A In our plans we don't
11 plan that to any substantial extent. The possible
12 exception might be in the delta area, for instance
13 where it is used now extensively. Outside of that I
14 don't think we have too much intent. We would take the
15 more direct route.

16 Q I mean either crossing
17 streams or going down them, either way, would you
18 have occasion to build an ice road on a frozen stream?

19 A Yes certainly, because
20 the pipeline itself will cross frozen streams; the
21 adjacent road will also cross.

22 Q You couldn't designate
23 the streams? Could you designate the streams?

24 A Well, all the streams
25 that the pipeline crosses will have an adjacent haul
26 road beside it, beside the pipeline excavation or
27 where the pipeline is to be installed.

28 Q It's my understanding
29 that a snow road is in essence an icing, is that
30 correct?

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2 I mean you're building layer on layer of -- if you cross
3 a stream with a snow road, have you not created an
4 icing on that stream?

5 A If you build an ice
6 bridge, that is a thickening of the natural ice, yes.

7 Q Well, I understand there
8 are problems associated with icings, and when you
9 build your road across, when you've created an icing
10 have you also plans for alleviation of the problems
11 that go with icing?

12 A In building an ice
13 bridge you normally spread water on top of the exist-
14 ing ice to thicken it, to make it structurally stronger.
15 Jack I believe we responded to that, to what that
16 does underneath the ice at an ice bridge. Does it
17 act as an insulator or would it be thicker under there?

18 WITNESS HOLLINGSHEAD: I think
19 there are two different phenomena, two different problems.

20 Q Well, that's basically
21 what I'm asking.

22 A Yeah, the icing is ground
23 fast ice, where you would probably thicken up an ice
24 cover to build an ice bridge for transportation purposes
25 it would probably be because there is a very signifi-
26 cant flow of water beneath the ice, i.e. in the Macken-
27 zie River, for instance.

28 Q That wouldn't have any
29 of the problems that an icing would have?

30 A No, ma'am.

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

Q This question is directed
to Dr. Hollingshead. Your transparency of the Great
Bear River shows a wharf facility that appears to be
about 500 feet long. Would that be correct?

A Well, it wasn't a wharf
facility, it was a proposal for a temporary work berm
and yes, it extended for about 400 feet out from the
right bank.

Q How much sediment will
be released into the river from that structure?

A I'm afraid I couldn't
say.

Q Can anyone answer that?

A Well, the material would
be primarily from the ditch. It would be broken rock
from the ditch and the question really is, I suppose,
how much fines would be generated along with that.
Those would be the only portion that would result in
sedimentation downstream, and I don't know what that
percent age would be.

Q You don't know how much
that would be?

A No.

Q Do you know what effect
that will have on the white fish or other fish in the
stream?

A No, I couldn't say what
effect. I would suggest it would be very, very
minimal, but --

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

Q Have any studies been
done?

A We have calculated the
increases in the velocity that would result from the
berm.

Q But you've had no direct
studies as to how any sediment--

A We have been led to
believe that these
would not affect the fish migration adversely.

Q You've been led to believe,
there has been some input from environmentalists
then, on your decision to build this particular
structure?

A Yes, we've talked to the
fish biologists regarding these structures and in fact
the velocities the figures to which I referred are in
the response to question 44, I think it is, to the
-- of the PAAG questions.

Q Would that response direct
me to a particular study that has been done gauging
the environmental impact of sediment on the white fish
in that stream?

A No, I don't think so.

Q It wouldn't. Are you
aware if any studies like that have been done or if you
could--

WITNESS CLARK: Perhaps I could
add that as a general rule, any activity associated
with the river is referred to our fish biologist consultants
and they have looked at this proposed work

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2 pad for the Great Bear River and it has been illustrated
3 to them, calculations have been done on the increased
4 velocity in order that they could determine whether
5 or not it would inhibit migration -- upstream migration
6 of fish. So there has been an input from the fish
7 biologists.

8 Q My question is basically
9 that are going to be
10 directed to the amount of sediments/ released into the
11 stream and the effect that that increase in sediments
12 specifically
13 is going to have on the white fish, not/ the velocity
14 of the stream.

15 A Yes, I can't quote a
16 specific report, but my understanding is that the
17 assessment based on the rock being used from the ditch
18 excavation would not generate a significant amount of
19 sediment. It's not the type of material you would
20 normally expect a lot of sediment from.

21 Q This goes back to your
22 statement that it's mostly large, chunky material
23 rather than fine silty kind of material.

24 WITNESS HOLLINGSHEAD: Yes,
25 that's right.

26 Q Dr. Cooper, would it be
27 fair to say that very few of the streams that you
28 anticipate crossing with the pipeline have been gauged?
29 That is you have measured the volume of water?

30 WITNESS COOPER: Yes, that's
true and for the most part they are the larger streams
that are gauged.

Clark, Hollingshead, McRoberts,
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Hardy, Williams
Cross-Exam by Lane

Q Which ones have been
gauged?

A Which ones have been?

Q Yes.

A The Mackenzie River in
several locations; the Liard River has; Great Bear
River; there is now a gauge on the Firth River; I be-
lieve the Willow Lake, I believe that's most of them.

Q What percentage would that
be of all the rivers that are going to be crossed?

A A very low percentage but
we must keep in mind that the major river crossings
are gauged.

Q But there are a signifi-
cant number that you're crossing that haven't been
gauged?

A Oh yes, a large number.

Q Would you say that the
percentage that have, represent 2%, 1% of the streams,
or --

A Before quoting a per-
centage figure, I think we'd have to count the total
number of streams and assign sizes to them.

Q When do you anticipate
that you're going to be gauging all the streams?

A Well, in the design of
the buried river crossings, it's not necessary to have
gauges on all the streams to predict scour, and to
complete the designs.

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2
3 THE COMMISSIONER: When you
4 speak of gauging the rivers, do you mean measuring the
5 volume of water flowing along the river and the velo-
6 city with which it flows? Is that what we're talking
7 about?

8 A We are talking about
9 measuring rate of flow of river, or the rate of flow
10 of water against time, and how the discharge varies
11 against time.
12
13
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Hardy, Williams
Cross Examination by Lane

MS. LANE:

Q And you haven't done a measurement of the sediment carrying capacity of those streams, or have you done? Obviously if you haven't gauged the stream --

WITNESS COOPER: A I believe that there are some sediment records on the Mackenzie River, but other than that, unless there's been some environmental work, I'd say, no.

Q You're not aware of any reports, of any measurement of sediment in anything besides the Mackenzie River?

A I'm not aware of it, no.

Q Is anybody else on the panel aware that, of any other measure of the sediment carrying capacity of other streams being done?

WITNESS HARDY: Well, I think it is fair to say to that question, I think it only fair to say that a person like Dr. Cooper, and Dr. Hollingshead, it's not a matter that they've got these problems with no background that gives them some indication as to the type of the river hydrolics if you like for a particular stream. And it's not a matter that they know nothing about the sediment capacity, it's a matter of degree. They will have some idea of what it might be, but they can't tell you precisely what it might be. It's a question of degree of accuracy, and they recognize, you see again when you talk about gauging a river, it's not that every river has a completely

Clark, Hollingshead, McRoberts
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Hardy, Williams
Cross Examination by Lane

1
2 different characteristic if you like, or gauging
3 pattern. The river hydrologists, the specialists in the
4 field, he can, he recognizes types of river basins, and
5 so it's a matter of precision with which he can assess
6 what will go on in that river. If I'm wrong, perhaps
7 Dr. Cooper or Dr. Hollingshead can correct me.

8 if
9 Q So in other words, /you
10 are going to cross certain rivers and you have to do
11 an analysis of the river to decide whether, how it
12 can be safely crossed. It means that you don't have to
13 do a river by river analysis, you kind of have a general
14 sort of knowledge that you apply to clumps of rivers?

15 A Oh, they do a river by
16 river analysis. But in the analogy you've brought up,
17 what he--the river hydrologist doesn't necessarily
18 have to have gauging records on that particular stream
19 in order to design the crossing.

20 Q Because he knows general
21 things about rivers and he kind of takes a groups of
22 rivers in a specific area and says, well, this river
23 is this?

24 A Well, he recognizes a
25 a whole series of things. For instance, it's the river
26 valley itself that he sees, where he wants to put his
27 crossing or/where he's looking at his potentiality. It may
28 have an effect on the high water mark you see, and the
29 high water level which is one of the major considerations
30 that he may be interested in you see, may be established
physically at the one location to a definite figure,

Clark, Hollingshead, McRoberts,
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Hardy, Williams
Cross Examination by Lane

1
2 within almost a few inches without any stream records.
3 In other cases, the stream records can be very valuable
4 to him. The point I'm trying to make is, you see , that
5 the specialist, the river hydrologist as a specialist,
6 it's not a matter that he goes with nothing or he goes
7 with everything, it's somewhere in between. And this
8 is why he is a specialist. He would like to have lots
9 of gauging records, but he'll never get them.

10 WITNESS COOPER: I should point
11 out that the design and the analysis required for a
12 buried pipeline crossing is much less sensitive to
13 stream flow records or to a knowledge on stream flow
14 records than for example the designs that would be
15 required for a dam and reservoir, where you would have
16 to know precisely how much water you might have to pass
17 in a flood. Or for example, the design of a bridge,
18 where you would have to know quite exactly the extreme
19 flood levels that you would obtain. But with a buried
20 river crossing, the designs are much less sensitive on
21 that particular parameter, if you like.

22 Q Well, to follow that up
23 just a bit, it's my understanding that when you cross
24 a river you have a bend point and a sag point, and these
25 you have attempted to put far enough away, or far enough
26 into the bank that they won't be exposed, either by
27 scouring from ice or by flooding. Now, in that case,
28 don't you have to be sensitive to exactly how prone
29 the stream is to flooding? You've just said that in
30 a dam you have to take into account flooding, well it

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams

Cross Examination by Lane

1 seems to me that it would be very sensitive in that
2 way?

3 A Well, no. Generally
4 where we, if you are talking about where we set sag
5 bends . We're more concerned with, can a bank erode,
6 and if it can, how fast? Much of this analysis is,
7 admittedly based on judgement, and judgement by
8 examining a large number of factors. With respect to
9 flooding levels, all we have to have is the answer to
10 one question, and that is, can an area be flooded, or
11 can't it? So whether it's going to take a precise
12 discharge to do that in that respect is not that relevant.

13 Q In other words, what this
14 comes down to is you don't do a stream by stream
15 analysis?

16 A Oh yes, we most definitely
17 do, do a stream by stream analysis, with regard to
18 assessing the erodability for example of a bank.

19 Q Have you done this for
20 all the crossings?

21 A Not in final detail, no.
22 This will be part of final design.

23 Q This question is directed
24 to Dr. Hardy. It's my understanding that you have
25 referred in past occasions to various reasons why
26 above-ground crossings, or above-the-river crossings
27 were not studied, or were studied then rejected. I
28 wonder if you could outline in greater detail, what the
29 hazards are?

30 WITNESS HARDY: A Well, I

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1 did point out at the same time of course, that this was
2 a very controversial question. But one of the most
3 serious objections these days to the overhead crossing,
4 is security.

5 Q You mean just because it's
6 exposed?

7 A It's up in the air. People
8 with rifles take shots at it, and they do.

9 Q Are there any other
10 hazards besides --

11 A Well, it becomes, there
12 are some things inherent in the design of an overhead
13 crossing, that it is a structure, a bridge structure
14 with a lot of detail on it, little clippings, clips
15 angles and little bolts and nuts and so on. And these
16 require maintainence you see. You don't run into that
17 sort of thing with the submarine crossings. It has
18 to be painted at periodic intervals, and the
19 maintainence on the overhead crossings, if they are of
20 any length you see, which if you're talking of any of
21 the large rivers on this line. My experience is based
22 on crossings of the Fraser River, the Quesnel River, the
23 Peace River. They are fairly substantial crossings,
24 some of the bridges.

25 Well, it requires, a pipeline
26 company you see, has to be an operating unit, and true
27 on the Mackenzie Valley Pipeline Company it would be a
28 big organization. But nevertheless you see, if you
29 think about overhead bridges, one of the factors and
30 only one, not the predominate one, not nearly as

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Cross Examination by Lane

1 important as is the question of security, is that you
2 would have to have riggers on your maintenance staff,
3 you see, and how many -- and a rigger is a very
4 expensive sort of workman. You see, and it's not a
5 thing that you can pick anybody right out of high
6 school or right in off the street and say, go out and
7 paint this bridge. He's 150 feet up in the air. And
8 so that's another factor that's against them, and all
9 of these things put together, I have seen in the past
10 20 years, I have seen opinions in the operators in the
11 northwestern part of this continent, in Alberta and
12 British Columbia certainly, seen their opinions, their
13 view points, crystallize against the use of overhead
14 crossings you see. I like them myself, you see, but
15 I have lost every argument with my pipeline friends
16 when I've suggested, well here's a place/^{maybe}you should be
17 talking about an overhead crossing. Does that answer
18 your question?

19 Q Yes, you've outlined then,
20 basically maintenance is a problem?

21 A Security, first of all.

22 Q Security, first of all,
23 maintenance, and having to hire more people to
24 work.

25 A Maintenance, and type of--
26 it introduces another class if you like of maintenance
27 personnel that is highly specialized. A rigger type,
28 the guy that's got to climb the bridges.

29 MR. COMMISSIONER: Excuse me,
30 Miss Lane, we'll take a break for coffee now.

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT.)

MISS LANE: Q This next question is for you, Dr. Clark. When you discuss dykes to stop erosion, now I'll explain what I think you mean by that. It's been explained to me that you put cement collars on the pipe when it's going down a slope or when it's going in the same direction that the water is flowing, downward, you would put small or large cement collars or some kind of collar on the pipe at certain intervals to keep the -- so that the water would be diverted in another direction besides the direction that the pipe is going. Is that what a dyke is?

WITNESS CLARK: No, that's a ditch plug, and it wouldn't -- cement would very unlikely be used; more commonly it's something like bags of sand, and they're called sack breakers in those instances.

Q What stops -- you wouldn't call those a dyke?

A No. No, a dyke would be on the slope to prevent concentrated flow of water down the slope. It would direct surface water across the berm where it wanted to go across the berm in the first instance before the pipeline was built, and where it crosses the berm then is what we call a berm break, and on the downslope side of that, immediately beside it we would have a ditch plugged.

Q So if it is collared around the

Clark, Hollingshead, McRoberts,
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Hardy, Williams
Cross-Exam by Lane

1
2 pipe is called a ditch plug, and on the surface it's
3 called a dyke.

4 A Yes.

5 Q But is the basic purpose
6 the same, to keep -- to divert water from its natural
7 course in the same, like natural course in the same
8 direction of the pipe to prevent erosion?

9 A No, the natural course
10 of the water wouldn't have been down the ditch. In
11 that instance it's to prevent it from taking an
12 unnatural course and eroding out the ditch back fill
13 In other instances it may be to divert water to a
14 natural drainage course that existed before construc-
15 tion, or in other instances it may be to intercept it
16 with sufficient frequency so that the volume of flow
17 is not really great, and it doesn't have a high eros-
18 ive capacity.

19 Q Now let's concentrate
20 that is
21 on the ground flow or the water/flowing beneath the
22 surface. In that case you use ditch plugs?

23 A That's where we would
24 use water flowing in the -- to prevent water from
25 flowing in the pipe ditch, yes.

26 Q What's to stop inter-
27 plug erosion?

28 A Well, they would be
29 placed at sufficient frequency so that there would
30 be no flow in the ditch there, inter-plug erosion.

Q So the natural -- all of

Clark, Hollingshead, McRoberts,
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Hardy, Williams
Cross-Exam by Lane

previous

the water from the/plug would be diverted, there would
be no more water flowing to the next one? I mean
there's obviously going to be some water flowing --

A Oh yes, well in some
circumstances you wouldn't want to use these plugs, you
would put in a non-erodable backfill if it was of
benefit to do that, if you wanted to assist in draining
a slope; but the normal circumstance will be to prevent
a massive flow of water, each plug prevents flow going
beyond that plug and therefore the water that is in
the ditch doesn't have a high erosive capacity.

Q I'm trying to understand
what are the consequences of diverting the natural
flow of the water beneath the ground by these ditch
plugs. Now, what I want to perhaps talk about is
what is going to be the tendency of the sandbags or
these plugs to stop water in a pool? Will it all
be diverted or will some of that water accumulate by
the sandbag around the pipe?

A That would depend upon
the ground water regime. For instance, in some
cases they would only be operative during say a storm,
a heavy run-off; but where there is a natural ground
water there, the backfill would be saturated the same
as the normal ground beside the ditch would be
saturated.

Q It's not -- during a
storm would be the only time you'd get an abnormal
accumulation, the rest would just naturally divert

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2 and it wouldn't sort of accumulate against the bag.

3 A Well, perhaps I could
4 clarify that. If there was not normally ground water
5 in that ditch, and you didn't^I/realize, have an oppor-
6 tunity to see these slides, but the slide I showed of an
7 actual sack breaker or ditch plug installation was in
8 a very dry ditch, as it turned out. Now that would
9 function only when there was a storm; but if there was
10 ground water in that slope in any event, the backfill
11 would be saturated the same as the natural soil would
12 be saturated.

13 Q Well, it would tend, around
14 the pipeline then, it would tend to freeze, would it
15 not, these accumulations of water?

16 A In the chilled portion
17 it would freeze, yes.

18 Q So you're going to get a
19 clump of ice where the water hits these bags.

20 A Perhaps we each have a
21 different mental picture, but if you have a steep slope
22 and water is accumulated behind the plug, there would
23 be ice there when the pipeline went into operation, yes.

24 Q And as more and more
25 water flows it's going to get larger and larger?

26 A Well, all the soil would
27 freeze then and it wouldn't -- there wouldn't be
28 flow, water flow.

29 Q I understand that you've
30 done some testing with these ditch plugs.

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2 A We haven't done any
3 testing, no.

4 Q But they were --

5 A They're very common.

6 Q They were in southern
7 areas, though, where they had been used, is that
8 correct?

9 A Yes, that's correct.

10 Q Have you had the
11 opportunity to test them in any of your test areas that
12 are in northern conditions, permafrost conditions?

13 A I don't believe that
14 ditch plugs were tested.

15 Q You haven't tested them
16 as yet?

17 A No, I don't recall any.

18 Q Would it be fair to say
19 then that this kind of device is at a fairly primitive
20 stage as far as its relationship to a pipeline in this
21 particular area, the permafrost area?

22 A No, I wouldn't certainly
23 say that. I think that it's a fairly straightforward
24 technique that can be assessed.

25 Q Well, ^{it is} /straightforward
26 if you use it in southern areas, but you haven't tested
27 it here.

28 A Well, its function is
29 to prevent the backfill from eroding, until the pipe
30 line goes into operation. After the pipeline goes into

Clark, Hollingshead, McRoberts,
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Hardy, Williams
Cross-Exam by Lane

operation the backfill immediately around the pipe will freeze. It will then be much, much more resistant to erosion.

Q Oh, I see, so in other words these -- what do you call them again --

A Plugs.

Q -- plugs, you use them only -- they're only useful before you start to run the gas.

A In this particular instance they're for a transient problem, a problem that would exist from the time of construction until the time of gas flowing.

Q And just to go over it again, you say there could be a problem of some buildup of a saturation of water by the bags that will freeze when you run the gas through?

A I certainly wouldn't call that a problem, it's something that will happen but I wouldn't call that a problem. I couldn't visualize how that would be a problem.

Q But it would happen though.

A Yes, the water in the backfill will freeze when the pipeline goes into operation.

Q Now you don't use these -- do you use these in any area -- no matter where you run the pipe, this area is eventually going to

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1

2

become frozen?

3

A No, we would use them on

4

slopes that are sufficiently steep that if we got

5

concentrated flow --

6

Q Yes, I understand that.

7

But no matter, you're going to use, eventually wherever

8

you use these plugs, the pipe itself will freeze

9

the area and they're no longer useful.

10

A They're no longer needed

11

at that point.

12

Q They're no longer needed.

13

A I should point out that

14

as a means of buoyancy control in some places, it's

15

an alternative method of preventing the pipe from

16

floating when a lot of water gets in, is to during

17

construction to flood the ditch so it will freeze.

18

Q So you in effect provide

19

the water if it isn't there already?

20

A We provide the water in

21

certain areas to prevent the pipe from floating during

22

say spring breakup or runoff during heavy storms

23

prior to the pipeline going into operation. That has

24

been tested at one of the test-sites.

25

Q Could you just describe

26

that, please?

27

A The controlled flooding

28

of a ditch was tested at the test-sites as a means of --

29

Q But quite apart from

30

anything to do with these plugs?

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1

2

A No, there were no plugs.

3

Q You haven't tested them

4

in any other northern test-sites?

5

A No.

6

Q I understand that in your

7

slide outlininingslope traverse there is a fire-break

8

shown. We are just curious as to how far the fire-

9

break will be from the pipeline.

10

A Well, that would be --

11

the fire-break was shown in the instance where say

12

trees were laid on the ground to disperse flow of

13

water. There wouldn't be a continuous string of

14

debris, and this break would be at the -- or the

15

barrier to concentrated flow would be at the edge of

16

the right-of-way.

17

Q How often would you have

18

to clear a fire-break?

19

A I don't think that there

20

is an answer to that. I assume you mean that it would

21

gradually fill up with debris and so on.

22

Q Well, basically the

23

material that you clear out of the way, so that you have

24

got your fire-break, are you going to burn it, move

25

it, do you just let it lie there, what's going to

26

happen to it?

27

A My understanding is that

28

most of the material that is cleared out of the way

29

would be burned in fire sleds at the time of construc-

30

tion. There may be instances where it could be used

Clark, Hollingshead, McRoberts,
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Hardy, Williams
Cross-Exam by Lane

1
2 for these -- similar to riprap, to break up concentrated
3 flows of water laid on the ground, and again this is
4 used commonly in highway construction, on the down-
5 stream side of culverts, to help disperse surface
6 flow.

7 Q So that you might use
8 some of the material taken out of the fire-break to
9 assist you in --

10 A I think that we might be
11 talking about two different things. What I'm des-
12 cribing is an area where there is a lot of cross-flow
13 across the right-of-way and we provide a break in the
14 berm, let's say for example every couple of hundred
15 feet, and that's to concentrate water through that
16 berm break. On the other side of the right-of-way
17 in order to disperse this water back in, there might
18 be brush and trees laid on the ground. It wouldn't be
19 laid in a continuous string. Every so often there
20 would be a break, so that if it ever caught fire
21 in any one place the whole thing wouldn't burn. So the
22 fire-break is actually in this layer of brush or
23 trees that is used to break up the flow of water.

24 Q I see. Dr. Hardy, you
25 have referred in the past to blasting to free ice
26 jams. Would this be done in any of the Arctic coastal
27 braided streams, say along the north --

28 WITNESS HARDY:
A Your question again?

29 I'm sorry.

30 Q You've referred in the

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1

2

past to blasting to free ice jams.

3

A Well, what I said was that

4

it was one thing that would be considered in dealing

5

with ice jams if one was developing and was out of

6

control. I didn't say we would necessarily do it.

7

Q Do you contemplate that

8

you would be likely to do ~~the~~ in any of the Arctic

9

coastal braided channels?

10

A Well, I certainly would

11

not. You wouldn't have ice jams in those braided

12

channels. You see, by the very nature of them it

13

just swings over into another channel.

14

Q So you wouldn't have to

15

use it there?

16

A Never use it there, no.

17

Q O.K.

18

A It would be, you see the

19

ice jamming that would really be serious is really

20

confined to about three rivers -- the Mackenzie, the

21

Liard, and the Bear and possibly not the Bear to any

22

degree. It's only the very large rivers, you see, that
you would

23

/have ice jams that would be hazardous to you.

24

Q In the Arctic coastal

25

area, I guess it's called the North Slope, are there

26

any places where the trough that you put the pipe into

27

would be blasted instead of ditched?

28

A Well, there is a possi-

29

bility of that, depending on where your line is in the

30

strip that constitutes the North Slope, you see,

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2 between the shoreline of the Beaufort Sea and so on,
3 and the hillside where you have rock outcropping
4 literally. They have a choice, you see, and this has
5 been again argumentative over the past four years as
6 to whether you take the higher land, it's not all that
7 much higher but it's -- it gets away from the high ice,
8 you have less severe high ice content permafrost if
9 you get up higher, but then you have more irregular
10 terrain, you see. You have to balance that off against
11 staying down. But if they went well up with the line
12 they could get into rock where they might be blasting,
13 but if they are really on the North Slope as such,
14 in the high ice content permafrost they would not
15 be using blasting.

16 Q You are saying then as
17 a general rule you wouldn't anticipate that they would
18 be doing it, but if they got into an area of rock, that
19 they might be blasting.

20 A Well, I think, you see
21 I don't have in my mind the precise location that you're
22 talking about, and of course it's been pointed out
23 they keep changing these things. They change them on
24 me as well as on you, but -- so that I'm not precisely
25 -- I can't visualize in my mind at the moment precisely
26 what the favored location is now in terms of what I
27 have seen in flying over these areas, you see, so I'd
28 have to look at the mosaics and see exactly where it
29 is, but my understanding is that, ^{and} there will be other
30 people, possibly other people right here who can answer

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Lane

1
2 this more accurately than I can. I don't -- I think
3 their location now is where they would have practically
4 no blasting.

5 Q So if its close to the
6 coast as opposed to being higher up away from the
7 coast---

8 A Well, it's down in the
9 North Slope country, not up in the rock country.
10 Perhaps Mr. --

11 Q So if it's farther
12 down where you believe it is now, they wouldn't have
13 to use blasting; but if they decide to be further up
14 the slope, then you would use blasting because you would
15 get into a rock area?

16 A You would be in a
17 situation where you would want to blast, yes.

18 Q Well then, the second
19 part of this question I'll direct to Mr. Williams.
20 I believe you said in the past that you were going
21 to use a sequential type of blasting, in other words
22 you would set charges for a mile or so, and then you
23 would set them off 1, 2, 3, 4 and they would just
24 keep going off in a row, is that correct?

25 WITNESS WILLIAMS: That can
26 be done, yes.

27 Q Is it not correct to
28 say that you plan to use this kind of blasting?
29
30

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
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1
2 A We got into a discussion
3 about blasting and I think we said that it's our desire
4 to use the wheel type ditching machine to the extent
5 possible and we are doing a lot of research to try to im-
6 prove this ditching machine. There will be blasting
7 required, in particular in bedrock conditions and in
8 frozen gravels that, and sands possibly that cannot
9 be excavated with the wheel type ditcher.

10 Q So you anticipate that
11 there will be some times when you will be using blasting?

12 A That is correct.

13 Q Well, what time of the
14 year do you suspect that this kind of blasting--that
15 blasting would be done?

16 A It will be done with the
17 pipeline construction which is mostly in the winter
18 months from November to April. The exception to that are
19 the major river crossings that may require blasting.
20 For instance, the Great Bear, but we say that the
21 blasting there would be done also in the wintertime
22 through the ice and the excavation would be done the
23 following summer.

24 Q Well, my concern is here,
25 I'm just trying to get at exactly/^{how flexible}you're going to be
26 when you're doing your blasting? If you come across
27 a Caribou herd for example, you can understand that
28 if they happen to be calving that could be very
29 distressing to them. If they're not, it may not hurt
30 them, but it may drive them to an area where perhaps

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1 their feeding is not as good as it might be. How
2 flexible are you going to be? You're building your
3 ditch and you come across a Caribou herd. Are you just
4 going to go ahead and blast, or are you going to say,
5 we'll find something else to do right now, and wait
6 until they've moved on?

7 A No, we've said in the
8 Exhibit that if the -- first of all, the construction
9 is mainly planned for the wintertime before the Caribou
10 start migrating, let alone calving. The pipeline
11 construction crews will be out of the area before
12 calving starts, but we have said in the Exhibit that
13 if construction is going on when the Caribou are
14 migrating, that the construction will stop until they
15 get by.

16 Q Okay, so you plan to be
17 flexible then?

18 A That is correct.

19 WITNESS HARDY: I think it
20 should be appreciated too, that right now, in Alberta
21 and British Columbia and the Territories, there are
22 regulations you see, which govern the pipeline operator,
23 and how he would proceed. You require literally a
24 permit to go into any river area you see, and do any
25 work, let alone blasting, and so there would be
26 restrictions put on the time that you could work. You
27 see, where in the rivers they would be particularly
28 concerned with the spawning period, and some rivers there
29 are more types of fish spawn than in others. And in my
30 own experience you see, there is one river in British

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1 Columbia where there's only two months of the year that
2 the Provincial Regulatory Authority dealing with the
3 fish hazard can say that they can work in the river, let
4 alone blast, you see.

5 Where in other cases, there's
6 only a month or two that they are restricted from working
7 Well that sort of thing will exist, that sort of
8 regulation will exist when this pipeline is built, and
9 if it didn't exist, I think you could rest assured that
10 the owners would have their own specialists advising
11 them on the hazards that would be encountered. The old
12 concept of simply you start in at "A" and go to "B"
13 with no, and build your pipeline, with no concept of
14 the environmental effects of it, just would not exist
15 in the construction of this line.

16 Q But even within the
17 licensed area within the period that you are licensed
18 that the authority say, okay, now's a good time, this
19 is a good time, it's probably going to be safe for
20 you to go ahead and blast because you're not going to
21 interfere with fish or caribou or whatever. Now
22 caribou I understand don't have any set migrating
23 pattern, so the chances are you may come across something
24 outside the norm, within your licensed period. My
25 question was basically designed, when you have to apply
26 your own discretion when you come across something
27 that you weren't expecting to find, are you going to be
28 flexible enough to stop or is this in the plans?

29 A By the size of this
30 project I can't visualize how that would not be so.

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1 You see there will be environmentalists in the field,
2 on the staff and I just can't see, it would be literally
3 negligence on the part of somebody in the construction
4 of this line if a situation such as that developed to
5 the point where there was damage..

6 Q Thank you. These next
7 questions are going to be directed to some clarifications
8 of the Assessment Group Memorandum. It is a white
9 clump of papers here.

10 I would like to begin with a
11 clarification of the response to the concern at page
12 14, and this is with reference to local bed scour.
13 Basically what I would like to ask is for a further
14 clarification of what exactly your response means. It
15 seems to me the response says, we know there is a
16 problem, we don't know the answers and we trust the
17 engineers. Is that basically what you are saying?

18 WITNESS COOPER: I think
19 basically the response here, just let me thumb through
20 it, or read through it first.

21 MR. MARSHALL: What was the
22 question in the Pipeline Application Assessment?

23 MS. LANE: Basically it's the--

24 THE COMMISSIONER: It's the
25 Supplementary Memorandum to the canned notes, page 14.

26 MS. LANE: It's basically
27 directed to the accuracy and the reliability of
28 this graph.

29 WITNESS COOPER: A Well, our
30 response in effect admits that there is a relatively

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1
2 high level of engineering judgement required to make
3 these scour predictions if you like. Recognizing this,
4 what possibly we don't say, is that we will provide this
5 expertise that has the capability to make this judgement,
6 and come up with proper design figures.

7 Q But you haven't as yet
8 got those answers?

9 A We've got the expertise
10 I believe.

11 Q You do have the expertise?

12 WITNESS HARDY: A I think
13 perhaps it's worth pointing out that the technical
14 design of river cross ings is at a higher level and
15 was started sooner in Alberta and Bristish Columbia
16 back in the early 1950's, than anywhere else on this
17 continent. And the expertise that is available to
18 deal with these problems is better than anywhere else,
19 in my judgement, on this continent. Better than they
20 have had on Aleyeska, I can say that positively because
21 the same people are doing the Aleyeska work and here
22 they are working at home. There they are working
23 elsewhere.

24 And so the thing is, it's a
25 complete misconception to suggest that the river
26 hydrolics people are going at these problems cold. They
27 have got better experience than any other organization
28 on this continent. And this is common engineering
29 design procedure, you see. You have to get an answer
30 to these problems. You don't necessarily wait for a

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1
2 scientific answer. That is what engineering is you see,
3 and so that while from the scientific point of view and
4 that is the context this question was asked in, there is
5 not a completely satisfactory scientific approach to
6 the solutions to these problems. But the engineering
7 experience, and the expertise that is being applied to
8 the problems on this pipeline and will be applied is
9 as good as is available anywhere.

10 And the procedures that are
11 being used in my own experience on several major pipelines
12 in this area, there has never been a single case of
13 failure of a river crossing from depth of scour
14 computation. That's been designed in accordance with
15 these principles that these people use.

16 Q So you're confident that
17 engineers will solve this problem--

18 A Absolutely confident of
19 that.

20 Q -- that you recognize?

21 MR. COMMISSIONER: Well, just
22 so I know where we're at Dr. Hardy, Miss Lane asked
23 about the response to the Government Assessment Group's
24 concern about the accuracy and reliability of scour
25 predictions. Are you saying that you don't have the
26 answer to this problem now, but that you are confident
27 that you will get it? Is that you are saying?

28 A No, sir. I'm saying
29 that first of all , that their concern is unfounded.
30 And if we never learn another thing, we can design these

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1
2 crossings that will be safe. Now the more information
3 we get, the more, they can either mean that they are
4 safer than they would be otherwise in terms of the
5 additional information or they could be made more
6 economical perhaps with additional information.

7 But the question you see,
8 seems to imply lack of confidence, or it seems to be
9 questioning the credibility of this group, and as I
10 I think read the order-in-council/it certainly is a valid and
11 necessary thing for this Commission to enquire into
12 the credibility of the people that have produced the
13 design and I think it's a fair question. But I think
14 we need to answer it in a completely, in some detail.
15 That's my position on it.

16 Q Oh yes, yes. Well, I'm
17 just looking at this response--

18 WITNESS COOPER: Possibly I
19 could clarify this slightly. In predicting scour, the
20 state of the science, if you like, is not advanced to
21 the point that you can teach the science in terms of a
22 number of precise formulas that you could then give
23 to a relatively junior engineer and instruct him to
24 turn out designs. It requires input from more
25 experienced people, from more highly trained people, and
26 it does require an input of judgement. Now, I think
27 that's the answer that we were trying to convey in this
28 response, it may not be that clear as it is written.

29 THE COMMISSIONER:
30 Yes, you said at page 14,
"as a result of recent studies initiated by this project,"

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1
2 that is Artic Gas' project, "and the Aleyeska project,
3 significant advances have been made, particularly with
4 respect to braided gravel bed rivers, which are prevalent
5 along the proposed route." On the next page you said,
6 among other things," although preliminary designs have
7 been based on the potential for scour under open water
8 conditions, it is recognized that local river bed
9 scour associated with the formation and release of
10 a severe ice-jam is an important consideration in the
11 design of buried river crossings. This is particularly
12 true for crossings of the Mackenzie River. The
13 potential depth and extent of bed scour is being given
14 detailed study in the field and office."

15 Well, does this mean that the
16 designs that you used were not applicable to the scour
17 problems that you would likely encounter on the
18 Mackenzie River?

19 A The preliminary designs
20 in the application are, you are correct there, are
21 based on open-water conditions. Now, the ice problem
22 is as it also states, being given study both in the
23 field and the office. What we have done, and what I
24 indicated in my direct evidence, is we have come up
25 with a maximum prediction, or the prediction of the
26 maximum scour that could occur. This is not necessarily
27 the optimal design because it is intended to be very
28 conservative. -

29 Q You see, I can accept
30 until someone proves him wrong, Dr. Hardy's assertion

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1
2 that geotechnical engineers in Alberta and British
3 Columbia are the leaders in the continent, if not the
4 world. What I'm interested in is, how far have they
5 gotten in solving the problems likely to be encountered
6 on the Mackenzie River? And I take it that there is
7 some distance still to go, is that what I am to infer
8 from the answer on pages 14 and 15?

9 Q Well, with reference to
10 that particular paragraph on page 15, and with reference
11 to a crossing of the Mackenzie River and the one that
12 is most susceptible to the deepest ice-jam related
13 scour. Yes, there is some distance to go to come up
14 with an optimal design. But not with a conservative
15 design. In other words, we have done an analysis that
16 we attempt to be conservative in all the inputs to this,
17 and we come up with a scour depth that would be caused
18 if a number of rather improbable conditions occurred
19 at once.

20 The question remains from the
21 point of view of design, is, is it necessary to design
22 for that severe an event? Now, as we go into final
23 design and get more information we may be able to
24 optimize that design.

25 WITNESS HARDY: Another way,
26 to put it sir, and incidentally I didn't mean to imply
27 that we were the best in the world in the field of
28 geotechnical engineering, just in river hydraulics
29 and my friends here. You see the question of crossing
30 the Mackenzie River with pipelines first came up in

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1
2 the recent context with the Mackenzie Valley group for
3 the oil line, back in '68 you see. I was associated
4 myself with the feasibility study and the recommendations
5 for a route and in particular the river crossings. I
6 was asked to give the scour depth and locate the sag
7 points, the two most important things, and I did that
8 you see.

9 Now, the thing is that --
10 and I didn't consider that I was not competent to do
11 that at all, unfortunately that was never built and so
12 there is no history of performance on it. But I did
13 not consider that I was not competent or had insufficient
14 information to design those two crossings that I
15 looked at. One at Sans Sault Rapids and another at
16 Fort Simpson. Now what Dr. Cooper is saying is, is
17 that what did I do, I didn't have any of the
18 empirical formula if you like available that he may
19 be developing and may use in connection with ice.
20 We knew there were scour holes in around Sans Sault
21 Rapids, so we did an empirical design. We didn't
22 know what produced those at those times, what produced
23 those scour holes. It's been hypothesized since that
24 there was ice jams, but as far as I'm concerned it
25 didn't matter what produced them. Some fellow might
26 have gone out there and blasted them out, we were to
27 produce a design that I in my judgement was safe and
28 conservative for the situation that we saw and
29 recognizing that it was not constant at that time.
30 Now what Dr. Cooper is saying is, that these things

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are important enough and it's not-to the extent you
can, you should go beyond the judgement factor and be
able to rationalize what you're doing.

Studies of that kind have been
conducted and are being conducted on this project.

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And so, as he puts it, he will have a greater level of confidence, if you like or the level of uncertainty in the design. He hopes to reduce that from what the situation would be or what it was certainly in 1968. I'm only too delighted to have him come along and tell me that, "Well, here's how you should have done that," but nevertheless we would have done it and I'd have complete confidence if they had built that. I don't know if that helps or not, sir.

THE COMMISSIONER: Thank you.

Excuse me for interrupting, Miss Lane. Go ahead.

MISS LANE: Q My next question relates to page 15 of that same group. It is a response to concern (f); "general degradation of the bed may result from pipeline related activity." It seems that your answer is basically again, it seems to me to be a non-answer. Basically what you seem to be saying is, "We don't mean any harm."

Could you perhaps -- for example you recognize that some degradation will take place and you have considered it, and you don't intend to permit pipeline related activities to upset the regime of the stream. Could you be a little more specific about that? What have you done to

WITNESS COOPER: Well, I think we--

0 -- illustrate that?

A -- shall I say over-
answered that question? I think the first couple of

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2 sentences deal with the bed degradation that might
3 occur, regardless of a pipeline, whether a pipeline
4 would be placed in or not; and as part of our analysis
5 and design we would anticipate this and assign the
6 pipeline elevation accordingly. Now, with respect to
7 pipeline related activities, there are one and possibly
8 two activities that would be -- that could, if
9 proper design attention wasn't placed on them, result
10 in bed degradation. For example, a borrow area down-
11 stream, if it wasn't properly designed. Now we say
12 here we have no intention of letting this endanger the
13 security of the pipeline, it's in our own interest to
14 properly design these borrow areas so that they will
15 not result in degradation.

16 Q So in other words it's
17 not that you just don't intend to, but that you actually
18 have designed methods to prevent that happening,
19 or to counter-balance the degrading aspects of the
20 pipeline building.

21 A well, we would design
22 the borrow areas, for example, so that they have
23 almost a negligible effect with respect to degrada-
24 tion.

25 Q Well, you said there
26 were two. Could you explain the second way in which
27 pipeline related activities would degrade the bed?

28 A Yes, yes, if a clearing
29 of a flood plain was too extensive there could be a
30 circumstance, a type of crossing. I don't know of any

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1
2 on this pipeline where we would actually be making
3 conditions easier for a cut-off to develop, and this
4 could result in degradation of the stream.

5 Q I didn't understand that.
6 Could you clarify that a little bit further?

7 A Well, in crossing the
8 flood plains we could come across circumstances where
9 the right-of-way clearing in itself would result in
10 actual channel shifting across a meander loop, if you
11 like, and that would result in degradation upstream of
12 the crossing. I don't know of any right now on the
13 pipeline that --

14 Q You're not aware of
15 any, there possibly could be?

16 A To the best of my know-
17 ledge there are none, and I've examined, at least on
18 air photographs, pretty well all crossings.

19 Q If you were to run
20 across this, do you have methods already designed to
21 cope with that?

22 A Yes.

23 Q For example, how do you
24 go about doing that?

25 A The first method we would
26 consider is limiting the width of clearing on the right-
27 of-way. Secondly, there are erosion control measures
28 that could be implemented upstream.

29 Q Now I understand that
30 selective backfills mean that sometimes the material

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1
2 you take out of the ditch is not material you put back
3 in once you put the pipe in because it's not suitable
4 to counteract the growing of this frost bulb. You would
5 use other kinds of material that would be less likely
6 to create a buoyancy in the pipe, is that what
7 "selective backfill" means?

8 WITNESS CLARK: "Selective
9 does mean it would
10 backfill" / be not the native material, it would be
11 imported backfill, yes.

12 Q Would there ever be a
13 situation where you would manufacture the backfill?
14 For example, do you use dryers and separators, using
15 the material you took out to make it into a more
16 acceptable material to put back into the ditch?

17 A No, I couldn't see the
18 dryers concept. It's possible that in some circumstan-
19 ces we may want to break up the frozen material, how-
20 ever the ditcher tests that have been done have indi-
21 cated that the backfill as it comes out in most instances
22 would be quite acceptable put right back in.

23 Q Well, in areas where
24 you are going to substitute --

25 A In areas where we use
26 selective backfill?

27 Q Yes.

28 A That would normally be
29 either gravel or a quarried rock.

30 Q And you wouldn't manu-
facture it, you wouldn't separate out the parts of

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1
2 this stuff you took out, to use as part of the
3 backfill, you would bring it all from some place else?

4 A It would normally be all
5 from some place else, yes.

6 Q What do you do with the
7 original material that was in the ditch?

8 A Well, it would depend
9 upon what that material was. In some instances, for
10 instance, we would use select backfill where there is
11 virtually pure ice. We haven't got a definite plan on
12 that, but in the case where it's pure ice I would see
13 it being spread on the right-of-way. If it were an
14 ice-rich silt, it could be part of the spoil mound
15 rather than the backfill below the natural ground
16 surface.

17 Q Would you take any of
18 it away? Would you dump any in rivers?

19 A Oh no, there would never
20 be any dumped in rivers. Perhaps an example where there
21 would be disposal would be where there was an extensive
22 cut and excess materials were required to be disposed
23 of. We would have to have a disposal site. Our
24 current thinking is that a disposal site would likely
25 be where it came from. If it were a quarry or a gravel
26 pit, removed from a stream, but we wouldn't put back
27 say a fine-grained material in a gravel river bed.

28 Q So in other words you
29 contemplate you take stuff out, you put stuff from another
30 area in, and you take whatever you took out back to

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1
2 the place where you got the stuff to substitute from.

3 A That would probably be the
4 most common situation but it would have to be assessed
5 as to the nature of the area where it came from, where
6 the select backfill came from, if it was feasible to
7 put it back there and dispose of it and revegetate it.

8 Q If it was material that
9 had a high ice content you'd just spread it on the
10 right-of-way and let it melt.

11 A If it was mostly ice
12 that's what I would visualize happening.

13 Q This question has to do
14 with an abandoned crossing at the Willow Lake River.
15 Now I understand that the ditches there would have been
16 approximately 40 feet deep. Would that be correct?

17 A I believe that is
18 correct, yes.

19 Q In order to reach where
20 you put the sag point in the pipe.

21 A Yes.

22 Q Are there going to be
23 any other river crossings where you would have to go
24 that deep to reach the sag point?

25 A I would certainly think
26 so but I would have to refer to other volumes to give
27 a specific instance. Perhaps Dr. Hollingshead could
28 comment on that.

29 WITNESS HOLLINGSHEAD : Yes,
30 I think that would be not uncommon.

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1
2 Q So that now if you had
3 a hole 40 feet deep, presumably you don't have any
4 equipment that can sit on top and reach down in and
5 dig it out. The dithers, do they work at 40 feet?

6 A No, the finished grade
7 of the excavation may be 40 feet deep. The finished
8 grade would probably reduce the cover over the pipe
9 to something less than that.

10 Q But when you're digging
11 this ditch, you can't sit on top of the ground and
12 dig down 40 feet. Isn't what happens / ^{that} you're going to
13 have to put the machine that does / ^{the} digging down inside
14 the ditch in order to dig it, in other words it's
15 going to have to be wider than your normal ditch would
16 be to accommodate the machinery that's going to dig it
17 out.

18 A There would be an initial
19 cut made, yes, which is wider than the normal ditch
20 in order to install the pipe.

21 Q How wide would your
22 widest machine be?

23 A The base of the initial
24 cut on that drawing which we showed on the Willow Lake
25 was in the order of 40 feet.

26 Q 40 feet wide?

27 A 40 feet wide.

28 Q As well as 40 feet down?

29 A Well, the ditch was 20
30 feet below the base of the cut at the bottom of the

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1
2 ditch.

3 Q All right. What sort of
4 equipment do you use in these circumstances to dig
5 this kind of a trench for your pipe, or for the sag point?

6 A It would probably be a
7 backhoe, but --

8 Q I'm sorry, would you
9 repeat that?

10 A It would probably be a
11 backhoe but perhaps Mr. Williams could describe the
12 equipment.

13 WITNESS WILLIAMS: The common
14 practice in unfrozen material is to do it with a dozer.
15 In frozen material if blasting is required, it would
16 probably be a dozer in combination with possibly a
17 backhoe.

18 Q My next questions are
19 directed to re-distribution of vegetation on the
20 berm. This is directed towards possible degradation
21 resulting from disturbance of the vegetation mat
22 with special reference to windy areas. For example,
23 there's going to be a time when there is no vegetation
24 covering the ground in the area where you're
25 building your berm and your ditch, and in the interval
26 are you anticipating additional erosion because of
27 the wind, particularly in windy areas, and are you
28 doing anything to combat that?

29 WITNESS CLARK: No, we wouldn't
30 anticipate extensive erosion from wind. My understand-

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1 ing is that the re-vegetation will take place as soon
2 as ambient conditions permit after the construction
3 spread has gone through, and there are several means
4 of doing this, but I think the most common method will
5 be that a mixture of seeds will be spread in the
6 disturbed zone right over the ditch.

7 Q M-hm.

8 A And that these ultimately
9 will take over and eventually the native seeds would
10 take over.

11 Q But in the meantime in
12 a windy area before those seeds begin to grow, is
13 wind not likely to carry this all away?

14 A I can certainly see that
15 there would be localized areas where we wouldn't have
16 an initial catch and it would have to be re-seeded
17 again. My understanding again is that there is a
18 fairly long period of time that you can do this seeding
19 in the summer. Nature tends to re-seed in the fall but
20 we have, I believe, seeded in the spring and had
21 catches of grass that summer.

22 Q But it's going to take
23 a number of days, weeks, months, for this vegetation
24 to grow.

25 A Well in the north, yes,
26 we think it will probably take until the natural species
27 have re-invaded, perhaps five years.

28 Q So you've got a period
29 of time when there is no vegetation, there is no
30

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1
2 mat protecting that ground.

3 A Oh yes, yes.

4 Q In windy areas what is
5 to prevent erosion from the wind blowing it away, the
6 seeds and all.

7 A Well, if it were a type
8 of material that could be eroded, that's quite possible,
9 for instance, sand. I think it's rather unlikely though
10 that all the seeds would ever be blown away. Actually
11 the phase two is where we are bringing our vegetation
12 people in that could speak to this much better than I
13 could, or in much more detail. But I would, on the
14 basis of the trials that have been done and general
15 re-vegetation processes, I can't think of an area that
16 would be eroded so badly that there wouldn't be--in
17 other words the conditions that would allow that to
18 happen, would also prevent natural vegetation.

19 Q Well, you have removed
20 a great patch of vegetation artificially. It's not a
21 matter of natural re-vegetation at all. It's going to
22 be a large area that doesn't have any cover, and I
23 would think it would take a significantly longer time.

24 A Well, if there is a
25 possibility that the soil under the organic mat
26 being eroded, that's one of the locations where
27 we have described where the organic mat would
28 initially be set aside.

29 Q M-hm.

30 A Backfill would go in

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1 and it would be covered with this fibrous material
2 that doesn't erode by wind, and in fact would still --

3 Q In other words, you're
4 putting back what you took off.

5 A Yes, but it would be put
6 back in, in some cases there is no advantage to taking
7 off the organic mat, in other cases there would
8 be an advantage.

9 Q Even if you did put it
10 back, though, Dr. Clark, isn't there going to be
11 more ground to cover with it, in fact you won't have
12 sufficient to put back because you've raised the
13 ground in a mound over the pipe so there's going to be
14 an area that you can't cover with this instant vege-
15 tation, you're going to have an area that's going to be
16 exposed until something can naturally grow.

17 A Yeah.

18 Q Is that not in danger of
19 wind erosion?

20 A Oh, there could be
21 localized wind erosion, but in that instance the
22 organic material can be spread over in a thinner layer.

23 Q You're not concerned
24 about wind erosion then?

25 A No, I don't believe
26 wind erosion will be a major concern at all.

27 Q Is this because you don't
28 think there is any, or because you're confident if there
29 is you can repair it fast and before any real damage
30 is done?

Clark, Hollingshead, McRoberts,
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1
2 A Well, with the -- I have
3 difficulty visualizing a situation with the normal wet
4 type of surface that you have, where we would have much
5 wind erosion.

6 WITNESS HARDY: It has never
7 been a problem as far as I have been aware, over the
8 past 20 years on some 3,000 miles of trunk pipeline in
9 northwestern Canada, and you see even up at Inuvik, you
10 see, you will get a period where the germination time
11 in the summer is almost a few hours. They have
12 temperatures of 80 and 24-hour a day sunlight, so that
13 your germination period can be -- can really be very
14 short; but in the event on the Pointed Mountain
15 Line, for example, you see, they've never lost a square
16 foot from wind erosion. Now this may have been simply
17 a favorable situation by chance in the one year they
18 were planting; where they didn't get their growth was
19 where there was waste material, really a tree chipping
20 that covered areas, where they had stockpiled logs
21 and had burned them; but I have never seen myself
22 a single area in British Columbia, Alberta, or the
23 Territories and the Yukon where there has been wind
24 erosion on pipeline right-of-ways.

25 WITNESS MORGENSTERN: Could
26 I comment? In the event that a localized wind erosion is
27 found and it would only be a local problem, there are
28 straw mats and artificial fabrics that are routinely
29 used to provide some resistance and also to provide
30 a base for vegetation to come back, so it's quite a

Clark, Hollingshead, McRoberts,
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Hardy, Williams
Cross-Exam by Lane

1
2 straightforward thing to come in and deter it.

3 Q All right, so you have
4 something that you can use in the event that you do
5 come across this problem, and that basically is some
6 kind of a mat that holds it down and still allows
7 vegetation to grow?

8 A Yes.

9 Q Is that what you're
10 saying?

11 WITNESS CLARK: Yes, that's
12 also been considered for slopes and it would also be
13 appropriate for - if there was a localized wind
14 erosion.

15 Q All right, to continue
16 on with the vegetation/the berm, you've anticipated that
17 water is going to flow over the berm or that water
18 will traverse the berms. Is this going to result in
19 one side as it goes up will be wet and the other side
20 is likely to become dry as time goes on, more wet on
21 one side and dry on the other, now is this likely to
22 re-distribute the kinds of plants that you find on
23 either side of the mound? ^{would} So you / find plants on one
24 side that are more likely to grow in wet soils and
25 plants on the other that are more likely to grow in dry
26 soil?

27 A I think that yes, you're
28 referring to what we call the down slope shadow
29 effect where upslope water is being diverted along the
30 mound and goes through a berm break and then it's
redistributed again on the other side, but in between

Clark, Hollingshead, McRoberts,
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Cross-Exam by Lane

1
2 these berm breaks which are spaced according to the
3 natural drainage pattern in any event, possibly there
4 could be a very localized effect of the downstream
5 or downslope shadow.

6 Q O.K., well then it could
7 tend to develop different patterns of plant communities
8 than existed when this ground was level?

9 A I am really not quali-
10 fied to speak on the different types of plant communi-
11 ties. I'm not sure what type of habitat, for
12 instance, the polar grass likes, how flexible it is
13 with respect to moisture.

14 Q Well, Mr. Williams,
15 did you test this kind of vegetation pattern at
16 Sans Sault when you were --

17 WITNESS WILLIAMS: I think
18 I can say "Yes." First of all the berm of excess
19 material over the pipeline in the northern areas
20 will have some ice content, and that during the
21 summer months that ice will melt and that berm will
22 subside, and the ideal situation would be to have the
23 berm subside back to normal ground level so that this
24 would then not happen.

25 Q I understood that you
26 needed the berm, though, to hold the pipe down.

27 A That's in the very
28 southern end of the line, in the southern end of the
29 discontinuous zone where there is a potential frost
30 heave problem.

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Q So you have built this
berm and you presumably don't want it to settle back
down to ground level, you want it to remain a berm, is
that correct, because you're using it to hold the
pipe down?

A In the discontinuous--

Q Is that correct? I'd
like to talk about that.

A We talked earlier about
manufacturing^a/surcharge or placing the surcharge.

Q Well, you are going to have
vegetation growing over it, is that correct?

A Over the surcharge?

Q Yeah, over this mound
over top.

A Yes.

Q Well, this is the kind of
thing I'm worried about, not where it's going to
disappear and become level again, but over a long
period of time you're going to have this artificial
hill, O.K., and you have natural drainage patterns
going over the hill. When they're going up the one
side of the hill, it's not likely to collect and
become wetter on that side and drier on the other side?

A Yes, I think Dr. Clark
suggested that shadow area would occur.

Q And it's possible that
you have vegetation that normally would grow in wet
areas growing on one side, and vegetation that would
normally grow in dry areas on the other side. Is

Clark, Hollingshead, McRoberts,
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1
2 that correct?

3 A That seems reasonable.

4 Q O.K. What kind of
5 studies have been done to determine exactly what kind
6 of effect this re-distribution would have on the active
7 layer underneath the mat? Is it --

8 WITNESS CLARK: This particular
9 berm that you're talking about, is in a frost heave
10 situation.

11 Q Exactly.

12 A And there is no active
13 layer, there is no perm_frost.

14 Q O.K., well if you've
15 got one side that's wetter and one side that's drier, are
16 you not likely to have the frost or that frost bulb,
17 that bulb of ice grow -- build higher on the side that
18 is wetter than on the side that is drier?

19 A No, I don't think it
20 will make much difference, but if it did it would tend
21 to be the opposite. The drier side has the lower
22 latent heat.

23 Q My understanding was that
24 if there was water tending to migrate towards the
25 pipe and build up into a frost bulb, is that not right?

26 A No, that's ice lensing.
27 The frost bulb is just the zone of frozen soil and in a
28 purely homogeneous soil in flat ground it would be
29 fairly uniform. But if there were a case where one
30 side had a higher moisture content than the other side,

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1
2 the bulb would grow into the drier soil much more
3 quickly, because it has a low latent heat, it freezes
4 sooner.

5 Q Well, if you have one
6 side growing faster than the other, is it not likely
7 that your frost bulb is going to erupt? If this is
8 your mound, O.K., your surcharge is designed to keep
9 the pipe down this way.

10 A Yes.

11 Q If because of the
12 re-vegetation you suddenly have the frost bulb growing
13 faster on one side than the other, is it not likely
14 to erupt in this direction rather than up?

15 A No.

16 Q Have you done any tests
17 at all to consider whether that would happen or not?

18 A It really doesn't require
19 testing, it's something that can be analyzed very
20 easily. You see, the effect of the pipeline in freezing
21 the soil is pretty localized, and it's overwhelmed by
22 the natural freezing and thawing that occurs. There
23 will always be, even in the permafrost layer,
24 an active layer, and in the non-permafrost
25 zone the influence -- the frost bulb would never
26 erupt to the surface, it just couldn't happen.

27 Q Well, you've built the
28 surcharge for a purpose and I understood that was
29 for that very purpose, to keep the pipe down, because of
30 the growth of the ice around the pipe in that direction

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1
2 lifting the pipe; but if the ice is growing at
3 another angle, is maybe not your surcharge in the
4 wrong spot, it's going/ ^{to} erupt out the side. Maybe, I'm
5 you know, obviously --

6 A Well, I'm trying to --
7 I know what you're getting at and I am trying to
8 formulate an answer that would be -- make it clear,
9 but it just couldn't happen. It would have to--it would be
10 inconceivable of ice lensing growing off in one
11 direction and causing an eruption away from the pipe-
12 line. It's the heat flux from the outside zone and
13 compared to the pipeline, it just wouldn't take that
14 configuration.

15 Q But the shape of the
16 bulb around the pipe could conceivably be'lopsided,
17 in other words if there was a dry area on the one
18 side and a wet area on the other, the dry area
19 would have a larger bulb on that side?

20 A Yes, by the same token
21 if there was water flow through, which I think we
22 showed some examples, I know they're in the orange
23 book somewhere, but in the case where frost bulb is
24 forming in say a gravel bed carrying water, it would
25 be distorted downstream because of the convective
26 heat that's coming in inhibiting the upstream growth
27 and it allows it to grow downstream. It would be a
28 slightly distorted shape of frost bulb.

29 Q But it's your opinion
30 it is inconceivable it would ever cause any problem

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Hardy, Williams
Cross-Exam by Lane

1
2 to the pipe.

3 A If I have understood
4 you, I think I have, it would be inconceivable that
5 the pipeline would cause ice lenses to develop and
6 erupt.

7 Q It's not going to have
8 the pipe floating kind of, I think you call it buoyancy,
9 it's not going to become floating on the angle direc-
10 tion rather than up. The problem is always going to
11 be up.

12 A Yes, once the pipeline
13 goes into operation, except where there's open water
14 our buoyancy problem pretty well disappears when the
15 soil freezes.

16 Q O.K., so in other words
17 that isn't a long enough period for this distorted
18 bulb to matter?

19 A No, no. What I was
20 getting at is as far as the buoyancy, the tendency of
21 the pipe to float, when the line goes into operation
22 all the water will freeze and it doesn't want to float
23 anymore.

24 Q As yet is there a
25 proposed procedure for the removal of oriented blocks
26 in those portions of the trench that you come upon that
27 contain archeological material?

28 A There has been an
29 archeological assessment of the entire pipeline and
30 certain areas have been flagged as being critical and
on our own reconnaissance
I know/ we have seen sites which I believe are of

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1
2 archeological interest. To my knowledge, the exact
3 procedure of dealing with archeological sites, I'm not
4 aware of them, they may exist but I can't answer better
5 than that.

6 Q Would anyone else know
7 if there are any exact procedures for dealing with --

8 MR. GENEST: We're going to
9 have some evidence on that in the environmental phase,
10 Mr. Commissioner.

11 MISS LANE: My next question
12 has to do with compressor stations.

13 Q How much do compressor
14 stations vibrate?

15 WITNESS CLARK: I would say
16 these particular compressor stations with turbines
17 would vibrate very little.

18 Q Very little.

19 WITNESS HARDY: I think you
20 have to recognize the problem of vibration. I think
21 it must be recognized that the problem of vibration
22 can't be answered in quite the simple terms that you
23 put the question. It's a very complicated problem to
24 analyze the vibration characteristics of the compressor
25 stations---

26 Q Well, I'll narrow it
27 a little bit.

28 A And the soil mass that's
29 affected with it, the two go together, you see.

30 Q Exactly.

A And there is a vibration

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1 problem that with some types of compressor stations
2 and on the Trans-Mountain and Westcoast systems where
3 they used in their first installations were reciprocating
4 engines, there is quite a severe problem. But then
5 on this project, you see, there are centrifugal compressors
6 as they are presently being planned, and the
7 vibration problem is largely -- it largely disappears,
8 when you use centrifugal units.
9

10 Q And the centrifugal units
11 are the ones that you anticipate using here?

12 A Mr. Williams can confirm
13 that, but that is my understanding.

14 Q When you build a compressor
15 station on pads or I guess they're gravel pads,
16 if there is any kind of vibration is that likely to
17 cause problems with the permafrost, or will it create
18 slurry? Is it likely to create a problem so that
19 the compressor station is a danger to itself?

20 WITNESS CLARK: It would not
21 create a slurry. To give you an example, a compressor
22 station founded on piles, if the unit was such that it
23 did vibrate, the pile soil mass has a natural frequency
24 -- a frequency which, when it coincides with the
25 frequency of the reciprocating machines which we're
26 not using, it does produce extensive vibrations. But
27 the normal frequency for unfrozen soils, the most
28 critical range for reciprocating engines is around
29 oh, 4 to 800 cycles per minute, in that range. We are
30 operating on a much higher range, well beyond that

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1 level, and again the details of the compressor stations,
2 the mechanical aspects of the compressor stations I
3 know are going to be dealt with by the next panel.
4 I don't want to defer any more than we have to, but
5 we can talk about the foundations/^{for it}really, the geo-
6 technical aspects.

7 Q Well, that's what I'm
8 really asking, are they likely to cause changes in the
9 permafrost, for example, because of vibrations?

10 A Not because of vibrations,
11 no.

12 Q But just their presence
13 might?

14 A Yes, if there are certain
15 areas where changes in the permafrost could occur and
16 in some cases where it would be acceptable for it to
17 occur, for instance a very thaw -stable soil that
18 doesn't significantly change in properties when it
19 thaws, we wouldn't propose to take extensive measures
20 to keep that from thawing. But the most common com-
21 pressor foundation on this project will be a pile
22 foundation and the piles will be designed so that
23 the load that they carry will be compatible with the
24 properties of the soils so they won't settle, they
25 won't deform.

26 Q In any case, there is
27 very little vibration in the kind of compressor
28 stations you're using?

29 A It's my understanding that
30 with these types of engines they have a very low

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vibration but that again is out of my area of competence.

WITNESS HARDY: I think the main point is that with the centrifical equipment, as Dr. Clark has said, that the vibration -- the frequency of vibration induced by the unit will never match the natural resonance frequency of the foundations and so if you have that situation you don't have a problem. It's a matter of when you --

Q If they match, then they become --

A -- with the centrifical or with the reciprocating units, as Dr. Clark pointed out, there is -- I'll extend his range a little bit from saying that R.P.M.s -- of revolutions per minute, that is , from about 175 up to 600, you see, you have the possibility of the vibration or the movement of the reciprocating units matching the natural frequency or the resonance frequency, you have the combined building foundation and the soil mass affected by it, and in that case you get very severe vibration. That sort of thing will not happen with the centrifical units that are being used or being planned, and it's largely because the resonance frequency problem doesn't exist.

Q So that's why you chose this particular kind of compressor station?

A Oh no, not necessarily, there are many other factors that go into it too.

WITNESS CLARK: I think it would be fair to say that the resonance frequency wasn't the major consideration in selecting this

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Cross-Exam by Lane

1
2 particular type of unit, and I think that the next
3 panel can amplify on the reasons as to why it was
4 chosen.

5 WITNESS HARDY: Geotechnically
6 you can design either system.

7 Q And it wouldn't create
8 a problem as far as disturbing the permafrost or
9 creating slurry or --

10 WITNESS CLARK: No, even in
11 those areas of unfrozen soils where they have reciprocating
12 engines, it is possible to design foundations that
13 will minimize these vibrations, and keep them within
14 tolerable limits.

15 WITNESS HARDY: The geo-
16 technical requirements are/the governing factor
17 in the selection of the compressor unit type.

18 WITNESS CLARK: This has been
19 subjected to a preliminary analysis and what one
20 needs is the final operating characteristics to analyze
21 this, and our preliminary analysis, which is shown in
22 one of the reports that was listed on foundation
23 design, I think, covers that.

24 Q I believe you've referred
25 to inter-disciplinary field reconnaissance and it's
26 my understanding, this is on page 7, I got a different
27 book here and I can't find it -- page 7 of the canned
28 evidence --

29 MR. GENEST: We're going to
30 have to find a better word for that. I will try to come

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up with one.

MISS LANE: Right at the top of page 7 you refer to -- I'll get to the beginning of the sentence:

"Several meetings between design engineers and environmental consultants have been held on this subject. Another example of the engineering and environmental inter-relationship which provides means of identifying environmental concerns is inter-disciplinary field reconnaissance of the route and ancillary sites."

My question is: Are there any reports available on these inter-disciplinary reconnaissance field studies?

A Yes, there was an inter-disciplinary study made that Dr. Hollingshead referred to that was a report made, I believe. That was one of existing pipeline facilities.

Q But are there no other reports?

A No formal reports other than that one that I am aware of, or that I can recall at this moment. The most recent inter-disciplinary reconnaissance was in Alaska last August, I believe.

Q Were there any field notes made on these?

A I'm sure we all had alignment sheets and notebooks.

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Q Could reports be made
from these field notes?

A I asked the environmental
consultants on that reconnaissance to write us any
observations they had, but we did meet every night
and discuss our -- what we had seen and our concerns,
and they have -- they are quite pressed also in
producing other reports, and I didn't press them for
it. When they get around to it we will have a record
of it. I did receive a letter from, I believe, Dr.
Banfield, confirming some of our discussions.

Q So that when you have
the opportunity you're going to produce these, are
you?

A That was my intent, that
the environmental consultants there present us, if they
had any significant observations to make that hadn't
been communicated, to do so, and I did receive only one
letter from the people that were on that.

Q So you can't say for
sure whether we are going to see any reports or not.

A No, at that particular
time they were pressing to complete their previous
research reports and in that we had discussed
all the things of significance, I said, "Don't inter-
rupt what you're doing of more importance, to
do this," so they may still be intending to document
it but I haven't pressed for it because we did have
all their observations at the time.

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Cross-Exam by Lane

1
2 Q So, we will depend on
3 you reporting what they report to you?

4 A I'm sorry, I don't
5 follow that.

6 Q Well, that inter-
7 disciplinary field reconnaissance, and the point of
8 the question is an interest in knowing exactly what
9 happened, what kind of things did you decide? Did you
10 make field notes? Did you study them? And your answer
11 seems to be saying, "Yes, we did and we talked about
12 it but we're not reporting about it, and if they did
13 they don't have time to make any formal reports."

14 A All of the environmental
15 consultants were very familiar with that route and
16 have participated in its location, and that particular
17 inter-disciplinary reconnaissance was to a large extent
18 by way of confirmation, and we would go to -- we
19 went virtually to every site of significance and
20 if they were content with what was planned, they would
21 say so; if they weren't content with what was planned,
22 they would say so and there was only one instance
23 that I recall where a change was suggested and everyone
24 there, whether those of us who were concerned with the
25 physical environment, were also in agreement with those
26 concerned with the wildlife, for instance, that we
27 should make a small change in one of the rivers.

28 THE COMMISSIONER: Excuse me,
29 that was a change in what, the location of a river
30 crossing or a change in the route, or --

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1
2 A It will be a change in
3 that particular river crossing, it's one I mentioned
4 before where a small slide had developed since we --

5 Q That was on the North
6 Slope.

7 A On the North Slope in
8 Alaska, that's right.

9 Q Right.

10 A And we were in agreement
11 -- complete agreement -- as to where we should move
12 that.

13

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MS. LANE:

Q Along the same lines, on page 14 of the canned evidence, at the top of the page and in paragraph (a), you mention that in addition to a number of informal meetings with environmental consultants, by that I presume you mean the informal chats you had while on your field reconnaissance, you had continuous interfacing with staff biologists and with the environmental group. Can you name the specific environmental consultants?

A Yes, ma'am.

Q Could you do that please?
From your interphase?

A The ichthyologists are Dr. McKart and Dr. Craig. The ornithologists with whom I had most contact in, in NES are Dr. Gun, and Dr. Swiensburg of L.G.L. Dr.'s McKart and Craig are with Aquatic Environments. Our consultant in mammals has been Mr. Jakumchuk and Mr. Retan. They are with Renewable Resources. In addition Dr. Banfield who is at Brock University has consulted on several aspects, and we've also had him review findings in reports and sought out his opinion on various things. He's now, I believe, incorporated a company that is called "Range-fir Consultants".

Our own staff include a number of plant ecologists. The leader of this particular group is Mr. Don Dabbs. You realize they have different specialties too. For instance re-vegetation. The expert that has done most of the

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1 studies and is doing extensive experimental work is
2 Dr. Younkin, Y-O-U-N-K-I-N. Our environmental manager
3 if you like of Northern Engineering is Mr. Ray Glassrude,
4 who is a wildlife biologist.

5 Q Thank you very much.

6 Page 15. For who was the proposed design manual
7 contemplated?

8 A It primarily will be
9 used by the design staff. It will comprise all of the
10 findings that have developed from our studies. There
11 are numerous reports, for instance on slope stability
12 on foundations, on drainage and erosion control and
13 depth of pipe burial and so on, which form a very, very
14 large volume and eventually these will be put into a
15 concise manual where the actual design evolving from
16 these studies is documented and the design procedures
17 are illustrated. So I would say that firstly that it's
18 for the use of the design staff.

19 Q So that when I read on
20 page 15, and I understand, I understood that the
21 design manual was basically a guide for people in the
22 field, the man in the field that comes across a situation
23 that wasn't accounted for by your test holes. You've
24 come across an area that the particular design that
25 he's ready to put down, or to construct, is not the one
26 that would be best suited to this particular kind of--

27 A No, that would be covered
28 by a design change manual.

29 Q All right, a design
30 change manual, I'm sorry. For whom is that written?

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1
2 A That is intended for the
3 field personnel.

4 Q Would it be true to say
5 that it would deal with things like anchoring, and
6 radius of curvature and that sort of thing?

7 A It wouldn't, it can't
8 be developed until the design is developed, so it would
9 be speculating now, to say what it would contain.
10 But I can give you an example of what I know one thing
11 it will contain. And that is for instance a change to
12 a foundation design.

13 And this is quite common. If
14 in the course of developing our design we drill a number
15 of test holes, and from those test holes we determine
16 a certain length and size of pile is required. And if
17 when they go in and construct this, one of the methods
18 will be to drill a hole, place a pile in it, and to
19 back fill it with a sand slurry which will freeze back.

20 Now, if during the process of
21 drilling this hole they locate some ice that the original
22 test holes had missed, then it would be, require a
23 change in design. I would suggest that the most likely
24 thing would be that the pile would have to be lengthened.
25 And the appropriate parameters for someone familiar with
26 foundation construction would be there in the design
27 change Manual so they could immediately advise the
28 contractor as to what depth he would have to drill that
29 pile to.

30 Q In other words, they may

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1 anticipate having to build one kind of thing, one kind
2 of structure, one kind of facility, come across a situation
3 and see that it's not the kind of terrain or area that
4 they had anticipated it was. They look in the manual
5 and say, "for the kind that we've got here, we use this
6 kind of design, another kind of design"?

7 A It would be a modification
8 of the existing design in most instances.

9 Q Well, what kind of
10 language is it going to be in?

11 A I can guarantee you that
12 C_v , won't be in that design manual.

13 Q They won't?

14 A C_v , won't. I'm sorry, you
15 missed that previous discussion, but it would have to
16 used by someone that is an engineer. The field
17 engineer would have to use it, but I would think that
18 it could be understood hopefully by anyone.

19 Q Because it seems that it
20 is impossible for you to explain now some of the on
21 site problems, and I'm just wondering how it's going to
22 be possible when you get to the construction phase
23 to come up with a manual that the man in the field
24 can understand? If you yourselves can't explain them
25 right now?

26 A I don't really agree that
27 it's impossible to explain them right now. I think
28 maybe what you mean is that we don't have site specific
29 information right now, and how could we later on.

30 Q Exactly.

1 A Well there will be just
2 a tremendous amount of additional investigation done
3 as a part of final design. All of these compressor
4 sites will be subjected to test drilling.

5 Q So that this design
6 manual isn't, design change manual isn't intended to
7 hel p the man constructing on the site to adapt to
8 a significant need for a design change? It would be
9 merely a matter of changing the design slightly so
10 that he could readily identify?

11 A The object of the
12 design of ocuse is to develop an initial design where
13 the design change manual would not be required at all.
14 But if for instance, during the construction of a
15 foundation for a compressor station, if a change is
16 encountered it would be, rather than to shut things
17 down and wait until somebody says what do I do, because
18 I have one pile in soil conditions that's different
19 from the design, he will have readily available
20 something that tells him what to do. So in a sense
21 it would expidite construction.

22 Q But this is going to
23 involve on-site decisions by --

24 A By qualified geotechnical
25 people, yes.

26 Q They wouldn't be like
27 the guy driving the bulldozer, or driving the pile or
28 whatever it is?

29 A He may offer an opinion
30 and it might well be worth listening to, but he

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Lane

1
2 wouldn't be charged with the responsibility of making
3 that decision.

4 Q Yes, but there would be
5 somebody there who is qualified, and that's who this
6 design change manual is designed for?

7 A Yes, ma'am.

8 Q Just one last question,
9 and I think it will be fairly brief. When you are
10 building the pipeline, in constructing river crossings
11 do you do this in the winter when the river is frozen?
12 Is it easier to do then?

13 A I believe some of the
14 major rivers would be constructed in the summertime,
15 but by and large most of the rivers would be constructed
16 in the wintertime, winter crossings.

17 Q Are you going to be
18 piling up ice that, you know, that you take out. I
19 presume you cut out big hunks of ice,?

20 A When you excavate
21 through the ice?

22 Q Yes.

23 A Yes.

24 Q How are you planning on
25 disposing, are you just going to pile it by the side,
26 what are you going to do with the ice?

27 A Again, I could give you
28 an opinion, it's not something that I personally
29 have addressed, but I would see a couple of alternatives.
30 One, is of spreading the ice downstream

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Lane

1
2 if it's a relatively small amount. The other is to
3 put it back in over whatever backfill is put in, in the
4 trench.

5 MS. LANE: That's all the
6 questions that I have.

7 MR. GENEST: Mr. Commissioner,
8 I wonder if I might be permitted a personal comment?
9 I found out through my spies that Miss Lane has just
10 arrived here from the Bar Admission course from the
11 Province of Ontario, and I am the senior member here
12 of the Bar of that Province, and I just wanted to say
13 that she has been thrown into a very difficult task,
14 and has performed it with great ability and aplomb.
15 I am only sorry that we have allowed her to escape
16 from our province.

17 MR. COMMISSIONER: Well, I
18 think that is something we all subscribe to. It's
19 very difficult to come in suddenly and to face all of
20 these very eminent engineers.

21 Well, I should add before we
22 go on that in the event that Mr. Bayly upon his return
23 discovers that any subject has been incompletely
24 canvassed with the panel, I think it would be fair to
25 allow him when these panelists return later on, on
26 other panels to come back to the geotechnical subjects
27 that have been discussed in this panel and to ask any
28 further questions that seem appropriate. If there is
29 no objection to that, I think that should be something
30 we should allow Mr. Bayly to do.

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination

1
2 MR. GENEST: I have no
3 objection, sir. Mr. Commissioner, one of my witnesses
4 has asked for a five minute break and I'm sure he has
5 a good reason for it.

6 MR. COMMISSIONER: Well, I
7 think that--

8 MR. SCOTT: The question is
9 which one, should we guess?

10 MR. COMMISSIONER: I'd like
11 that witness to return for every panel then. I think
12 it is an excellent idea.

13 (PROCEEDINGS ADJOURNED)
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MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF AN APPLICATION BY CANADIAN ARCTIC
GAS PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT
BE GRANTED ACROSS CROWN LANDS WITHIN THE YUKON
TERRITORY AND THE NORTHWEST TERRITORIES FOR THE
PURPOSE OF THE PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE
PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.,

April 7, 1975.

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APPEARANCES:

Mr. Ian G. Scott, Q.C.	
Mr. Stephen T. Goudge,	
Mr. Alick Ryder and	
Mr. Ian Roland	for Mackenzie Valley Pipeline Inquiry;
Mr. Pierre Genest, Q.C.	
Mr. Jack Marshall,	
Mr. Darryl Carter and	
Mr. John Steeves	for Canadian Arctic Gas Pipeline Limited;
Mr. Reginald Gibbs, Q.C.	
Mr. Alan Hollingworth	for Foothills Pipelines Ltd.;
Mr. Russell Anthony, and	
Prof. Alastair Lucas	for Canadian Arctic Resources Committee;
Mr. Glen W. Bell and	
Mr. Gerry Sutton	For Northwest Territories Indian Brotherhood and Metis Association of the Northwest Territories;
Miss Lesley Lane	for Inuit Tapirisat of Canada and . The Committee for Original Peoples' Entitlement;
Mr. Ron Veale and	
Mr. Allen Lueck,	for Council for Yukon Indians
Mr. Carson H. Templeton,	for Environmental Pro- tection Board;
Mr. David Reesor,	for Northwest Territories Association of Munici- palities;
Mr. Murray Sigler,	for Northwest Territories Chamber of Commerce.

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WITNESSES FOR APPLICANT:

John Ivor CLARK
Garry Wood HOLLINGSHEAD
Edward Charles McROBERTS
William Alexander SLUSARCHUK
Norman Reuben MORGENSTERN
Richard H. COOPER
Guy Leslie WILLIAMS
R.H. HARDY
- Cross-Examination by Mr. Scott

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Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Mr. Scott

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

CROSS EXAMINATION BY MR. SCOTT:

Q Dr. Clark, what is the
name of the department that you are the head of at
Northern Engineering?

A The department is
Geotechnical and Environmental Division.

Q I take it that under you
in that department are some of the geotechnical people
who are on the present panel?

A That's correct, yes.

Q Yes, and full time in
your department are Dr. McRoberts, Dr. Slusarchuk, and
Dr. Hollingshead?

A That's correct, yes.

Q Yes. And the other
members of the panel, with the exception of Mr. Williams
are consultants who are available to give assistance
from time to time as required?

A Yes, that is correct.
Dr. Hardy is also a Director of Northern Engineering.

Q Yes, he makes the
corporate decisions at the top, but he's not a full
time person reporting to you within your department?

A Not fulltime, no.

Q Am I correct in assuming
that Mr. Williams is not really in that department?

A Mr. Williams heads
another department.

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

Q Yes, he's here to fill in
the blanks, he's not here as a geotechnician?

A That's correct.

Q Well, now, I take it that
also under you in this department, on either a part-time
or a full-time basis, are various environmental and
socio-economic experts who feed you information or who
respond to your ideas and problems?

A That's correct.

Q And it's your obligation
then to coordinate the work of those persons, that is
the environmental and socio-economic employees or
consultants with the geotechnical people who are on
your staff or who act as consultants?

A The coordination of the
environmental consultants is largely handled by our
environmental manager who would report to me largely
in an administrative, but it is an obligation yes to
bring the interface of the environmental, and living
environment with the physical environment.

Q Yes, but all that
happens within the administrative, employee
framework of which you are the boss?

A Within this particular
division, yes.

Q Yes. Well, am I correct
about this. That if you were building a bridge, if
your mandate was to build a bridge over the Don River
in Toronto, you would --

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

1
2 I choose the river as one that has only limited
3 environmental virtues at the present time. But I take
4 it that your function as an engineer or as a geotechnician
5 would be primarily to see that the bridge was
6 constructed in an economic fashion. That is, at the
7 lowest reasonable cost. Would that be one of the things
8 that you would consider?

9 A Certainly cost would be
10 considered.

11 Q Yes, and the second thing,
12 interrelating of course with cost, would be to see that
13 it was a secure bridge and would do the job that your
14 employer's told you the bridge had to do, in terms of
15 weight and stresses and so on?

16 A That would be one of the
17 considerations, yes.

18 Q Yes, and I take it that
19 in a very simplistic project those would be the two
20 objectives of an engineer to assure a design that is
21 suitable for the needs of the client and to assure it
22 at the best and most reasonable cost?

23 A No, I don't believe that's
24 exclusively the area where a geotechnical engineer would
25 concern himself with. He would also be concerned with
26 overall stability, how it might affect the river
27 regime, what downstream effects that might have and so
28 on. It's not a site specific thing, it's more of a
29 reach.

30 Q Yes, well I put it to you

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Willaims
Cross Examination by Scott

1
2 that one of the particular challenges of the mandate
3 that you have at Northern Engineering from your client,
4 is that the Geotechnical Department, or the department
5 that you head must be concerned not only with the
6 security of the pipeline, security of supply and the
7 economics, that is devising a scheme that will cost
8 as little as possible, but you are also specifically
9 charged in this project with, where possible, carrying
10 out that obligation in a way that assures minimum
11 adverse environmental or social impact?

12 A Minimum disruption to
13 the environment, yes.

14 Q And to the communities
15 through which, or adjacent to which the pipeline will
16 pass?

17 A I believe that is a
18 consideration, yes.

19 Q And wouldn't you agree
20 with me that in this particular case your employers
21 have given you a specific and special mandate to see
22 that where possible environmental concerns and social
23 concerns, and it says where possible, are met, consistent
24 with security and economics?

25 A Yes, the social concerns
26 have been expressed to our client, directly by socio-
27 economic consultants, and it would probably have more
28 of a bearing on location than it would have on actual
29 design.

30 Q Are you telling us there,

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

1
2 that really feeding into your department there are only
3 the environmental impacts, or the environmental experts
4 advice, that the social advice feeds in at a different
5 level? That is directly to the client?

6 A It would feed to us from
7 the client by and large.

8 Q I see. But both sources
9 of information ultimately come to you?

10 A Where it is appropriate.

11 Q And wouldn't you agree
12 with me therefore that your department at Northern
13 Engineering is therefore substantially different than
14 the department of a company designed, ordered to build
15 a bridge across the Don River would be, because you
16 have these two special responsibilities and
17 advice and assistance in them, of which you are prepared
18 to take account?

19 A I think that most major
20 engineering projects now, whether it is a structure or
21 a development or a bridge or a pipeline has similar
22 input to it.

23 Q Have you gone to any
24 special trouble?

25 A I'm not sure what you
26 mean by "special trouble"?

27 Q Well, is this project, is
28 the design aspect of this pipeline carried out with the
29 routine consideration for environment and social impacts
30 that we associate with other pipeline projects in Canada?

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

1
2 A No, I'd say that it goes
3 quite a step beyond the routine, because of the
4 different terrain and the different conditions.

5 Q And I take it goes beyond
6 that routine because you see it as a special kind of
7 mandate where possible to alleviate these concerns?

8 A That's correct.

9 Q Yes. And we had it from
10 the last panel that one of the ways that they can be
11 alleviated, we're speaking abstractly now, is by
12 routing and routing modifications?

13 A That's correct.

14 Q Now, do I understand
15 correctly that routing really has nothing to do with
16 your department?

17 A No, that's not correct.

18 Q Yes, -- it's not correct?

19 A That's not correct.

20 Q I see. You have routing
21 as a function of your department as well?

22 A Yes, they are concerned
23 with the physical environment, with the terrain and the
24 concept of a straight line joining up two control points
25 for instance river crossings just doesn't hold true.
26 We have routed around potentially unstable terrain which
27 would affect the physical environment and has been
28 assessed by geotechnical engineers.

29 Q And would you also agree
30 then if routing is within your sphere of jurisdiction

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

1
2 that the two principle ways in which you can respond
3 to environmental, alledgely adverse environmental
4 problems or social problems, are (a) by routing and
5 (b) by design?

6 A I would suggest,
7 that if I understand your question, impact on the
8 physical environment can be minimized by selection of
9 the route, by the design, and by the construction
10 timing.

11 Q Leaving aside the construction
12 timing for the moment, because we will be dealing with
13 that later, would you agree with me that the two
14 substantial tools you have to deal with environmental
15 and social concerns are your ability to route and your
16 ability to design your way around problems.or over them.
17 as the case may be?

18 A Those are two of the tools
19 yes.

20 Q Do any others occur to
21 you? Apart from construction modes and timing?

22 A No, I would say that
23 routing and design, and timing are the significant
24 features.

25 Q Yes, well now, I respectfully
26 suggest to you that the challenge of this particular
27 project is that it is the first construction of a chilled
28 pipeline in permafrost or in discontinuous permafrost
29 on this continent?

30 A Yes, I believe we said so.

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
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Cross Examination by Scott

Q Yes. And that at least
in that sense, the project is fundamentally different
in type than a construction of a pipeline from London,
Ontario to Toronto?

A The pipeline aspect of it
is different, yes.

Q Yes. I take it that the
tools you have to help you meet this challenge are the
following: first of all you know a great deal about
pipe, or you have available resources that know a great
deal about pipeline construction generally in Southern
Canada and perhaps in other parts of the world?

A Yes.

Q You have in addition, a
core of experts for these purposes we will say, the most
competent in Canada, I am not able to make any other
judgement, but you have available a core of experts who
are capable of analysizing problems as you understand
it and proposing solutions for them?

A That's correct.

Q Yes. In addition to that
you have the test sites that your company, your client
has established?

A Yes.

Q In addition to that, you
have the geothermal computer analysis?

A Yes, that's one of our
tools.

Q But I take it that with

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

1
2 all those aids, this particular project will be tested
3 in the field?

4 A No, I don't believe that
5 that's correct. There are certain testing procedures
6 that will be carried out in the field.

7 Q Let me put this proposition
8 to you. If I were to build, if I were to begin to
9 build a dam to stop and contain a flow of a river, I
10 would have available if I was prepared to pay for it,
11 the kind of things that you and I have discussed. Such
12 as analysts and diagnosticians of a geotechnical type
13 and learned papers, and I would also have precedents
14 that responded directly to the kind of problem that
15 confront me, that is the construction of a dam on a
16 river?

17 A No, I don't believe that
18 that is necessarily true, because there has in recent
19 years for instance been tremendous developments in the
20 heights of earth-fill dams and there's almost -- every
21 geotechnical, or every project involving geotechnical
22 consideration will usually have certain unique aspects
23 to it.

24 Q Well, I understand that
25 every river has unique aspects to it, we will be coming
26 to that, but I take it that the chap who built the
27 first dam was at a disadvantage, that the chap who
28 builds the 150th isn't?

29 A Well, yes, and the chap
30 who builds the 800 foot high earth-fill dam is at a

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

1
2 disadvantage that the one that built a 200 foot high
3 earth fill dam.

4 Q I understand that, but
5 that's really becoming to be a question of degree isn't
6 it at a certain point? The marginal disadvantage to
7 decreases?

8 A No, I don't believe that
9 that is necessarily true. It could involve completely
10 different concepts.

11 Q Well, I put it to you
12 Dr. Clark, and I regard this as the challenge
13 your task, I don't say it critically, someone has to
14 be first, but I put it to you that the challenge of
15 this particular task is that you are building for the
16 first time in North America a chilled pipeline in
17 permafrost and discontinuous permafrost areas? And
18 that there is no precedent for that particular kind of
19 project?

20 A That's correct.

21 Q Yes, and would you agree
22 with me, to carry my analogy a little further that you
23 are more like the man who is building the first dam
24 than you are like the man who is build the 151st?

25 A I again, can't -- that's
26 not really a very good analogy I don't think, because
27 the 151st might be a very unique dam that has never
28 been built before.

29 Q All right. It might be
30 so unique that it was like the first.

Clark, Hollingshead, McRoberts
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Cross Examination by Scott

A It's possible.

Q Well, I think we are not
so far apart. I take it that when Arctic Gas, you would
agree with me, that when Arctic Gas has built, builds
it's chilled gas pipeline down the Mackenzie Valley
the chaps who decide to build a chilled polar gas pipeline
are^{going} to be able to learn something from your
experience?

A I would think so yes.

Q And they will have
an advantage by your very presence that you don't now
have?

A In certain areas, they
certainly would.

Q In the fundamental areas
with which we are concerned in this case, that is the
question of passing chilled gas through these two kinds
of terrains, permafrost, and discontinuous permafrost?

A Yes.

Q Yes, and therefore you
will agree with me that if and when your pipeline is
built and has been sitting there working for five years
a lot of the problems that trouble us and your panelists
perhaps academically, will either have been solved or
their nature exposed?

A I believe the major
problems as you put it will have been settled or put
aside long before it's been in operation for five years.

Q Yes. Well, one of the

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

1 things that frankly impressed me was your observation
2 that -- first of all, I take it that you are at what
3 is called the Preliminary Design Stage?
4

5 A That's correct.

6 Q And I think you have
7 emphasized and I won't go over it that a great deal of
8 work will be done before final design?

9 A Yes.

10 Q The thing that impressed
11 me was your evidence that at this stage you have the
12 tools to build, and I take it you were talking about
13 the geotechnical tools, to build a pipeline that will
14 be economical and secure?

15 A We believe that we have
16 established feasibility of the line.

17 Q Yes. That was, I take it
18 you attach no qualifications to that statement? You've
19 got the tools?

20 A Yes, we believe that
21 they are designs that we would apply that are very
22 conservative now.

23 Q And I take it that the
24 process as you have said just now, the tools that you
25 have devised are very conservative tools?

26 A That's correct, yes.

27 Q And conservative means,
28 more expensive than necessary to assure that the problem
29 will be adequately resolved?

30 A Yes, more expensive than

1
2 may be necessary.

3 Q Yes, and the process that
4 is before you, if these regulatory agencies ever get
5 out of the way, the prospect that is before you is to
6 refine those tools, those solutions so that they become
7 consistent with security and safety, less conservative
8 and therefore less expensive?

9 A This is what we referred
10 to as optimization of design.

11 Q Right. But just so I'll
12 be clear, you're confident that you have an armoury
13 of geotechnical solutions to all of the problems that
14 will confront you in the construction of this pipeline?

15 A We believe we have.

16 Q Yes. Well now, I would
17 like to ask each of the panelists in turn a question,
18 just to get their response. Inquiries like this only
19 take place once, respectfully Mr. Commissioner, and as
20 a matter of record it will be significant to know. I
21 want to ask each of the panelists, and take some time
22 to think about it, to respond to something that has
23 troubled me, and which is, that confronted with this
24 enormous project, with problems of great complexity
25 and novelty, there appears to be a universal assurance
26 that the thing can be done without, that the geotechnical
27 solutions are now in hand. And with that in mind, as
28 a matter of record, I would like to ask each of you,
29 if there's anything you don't know now that you would
30 like to know, before you approve the geotechnical solutions

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

1
2 for this preliminary stage? Perhaps we'll begin with
3 Dr. McRoberts?

4 WITNESS McROBERTS: In regard
5 to the areas that I'm responsible for -- yes, I would
6 say that we could go ahead and put in a perfectly safe
7 pipeline system. Given the state of design that we
8 are at now, which is as I understood your question, any
9 other information required for preliminary design.

10 Q What I want to know now,
11 is there anything else you want to know before you
12 approve this design and certify that all the geotechnical
13 solutions are there?

14 A You mean the final design
15 stage?

16 Q No, I'm talking about
17 the armoury of geotechnical solutions to which Dr.
18 Clark is concerned with, has referred. Is there anything
19 else you want to know before you certify that the
20 geotechnical solutions are all in hand?

21 A I think they are all
22 in hand.

23 Q There's nothing else you
24 want to know at this stage?

25 A Prior to final design?

26 Q Right.

27 A No, I am happy with the
28 work that I am doing.

29 Q Yes, Dr. Slusarchuk?
30

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

1
2 sir?

WITNESS SLUSARCHUK: A Yes

3 Q How about you, is there
4 anything further that you want to know before you
5 assert that we have all the design solutions in had
6 hand for your particular aspect of the project?

7 A I understand that we
8 are talking about preliminary design sir, and I am
9 satisfied that we have the tools in hand.

10 Q I see. There's nothing
11 else you want to know before you approve the preliminary
12 design?

13 A That's what I said, sir,
14 yes.

15 Q Yes, I see, Dr. Hollingshead?

16 WITNESS HOLLINGSHEAD: A Yes
17 sir, I think with respect to the river channels themselves
18 I would agree.

19 Q There's nothing else you
20 want to know?

21 A For this preliminary design
22 stage, no.
23
24
25
26
27
28
29
30

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

1
2
3 It depends on how many streams you want designed at this
4 preliminary stage. We have shown a number for which we
5 have some data and for which we have assumed data which
6 doesn't exist. We have referred to these as preliminary
7 designs, the techniques and the tools which we have
8 at hand would not change for the others.

9 I am quite happy that we have
10 the tools that we need at this stage of the game, yes.

11 MR. SCOTT: Nothing else that
12 you want to know at this stage?

13 A No sir.

14 Q Dr. Cooper?

15 WITNESS COOPER: I'm afraid
16 I've got to ask you what you mean by "approving the
17 preliminary designs".

18 Q Well, as I understand
19 the proposition, this panel has come forward and it is the
20 only and if I may respectfully say so, as competent
21 a panel as one is likely to get in this country, and it
22 has said that, "We have in hand all the tools that
23 can solve all the geotechnical problems associated
24 with this project."

25 Now it is conceded that
26 as you go along to final design it will be necessary
27 to do further work to decide whether solution "A" or
28 solution "B" is adopted, or to decide perhaps that
29 there is a completely novel problem. But what I'm asking
30 you is, is your presence on the panel representing that

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

1 your full satisfaction that you know everything you
2 want to know at this stage to certify to the public
3 that this work can be done safely and with integrity?

4 WITNESS COOPER: Yes, in my
5 opinion it is stated that way.

6 Q And Dr. Morgenstern, I
7 take it that you agree?

8 WITNESS MORGENSTERN: Yes, I
9 think one should stress that the issue at preliminary
10 design for a project that contains the novel elements
11 of this one is to identify these novel problems and
12 establish design methodology and to convince one-
13 self that you can get the final design data. To this
14 regard I am quite happy that we have an economic and
15 feasible design that reflects the current state of
16 the art.

17 Q Well, let me just see if
18 I understand that answer. You have told us, as I under-
19 stand it, that at this stage one of the, obviously I
20 guess, essential functions is to identify the problems,
21 first of all; and I take it it's your view that all
22 the problems have been identified.

23 A Yes.

24 Q Yes. Then what happens --

25 A To establish a procedure
26 for solving these problems, for example, frost heave
27 is a novel problem, and procedures to resolve these
28 problems in design have been put forward and we believe
29 that as part of final design we can get the line or
30 the mile by mile or site specific data to implement

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1
2 that design.

3 Q Well, what I'm really
4 asking you is, you can obviously identify the problems
5 or you have to your satisfaction. Are you satisfied
6 at this stage that they're solved?

7 A Yes.

8 Q Yes. Dr. Hardy, do you
9 agree?

10 WITNESS HARDY: Yes, I agree
11 with the answer. Yes, I agree. I like the phrasing as you
12 put the question last though better than as you originally
13 phrased it. When you say that "Do we know all the
14 answers?" Then that's a little different pie.

15 Q I didn't mean to ask if
16 you knew all the answers. I meant to ask you if there
17 was anything else you wanted to know before you approved
18 this as a matter of preliminary design?

19 A In my opinion we have
20 the capability to handle any design eventuality that
21 can come up or has come up.

22 Q Well, I am sure you have
23 the capability because that has to do with energy and
24 drive and perhaps other things; but--

25 A No, no, it's not.

26 Q -- are you satisfied
27 that you have the knowledge?

28 A Yes sir.

29 Q So that at this stage
30 there is nothing further that you need to know before

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1 you say that this project should go ahead at the
2 preliminary stage? At preliminary design.

3 A I don't like the
4 phraseology, "there is nothing else that I need to know".
5 I am still learning, I'm just a young fellow and am
6 learning every day. This is where -- I don't think
7 there really is much difference here. But any sugges-
8 tion that we think we can sit here pat, you see, and
9 that this pipeline is going to be finished without
10 any more thinking about it, is wrong. Some of these
11 problems are difficult problems, we'll have to devote
12 attention to them. We ~~might~~ even have to come up with
13 more research; but as it stands today there is no pro-
14 blem that I am aware of that I thought needed special
15 investigation, in which we have been refused the money
16 to go ahead with it.

17 Q Well, let me ask Dr.
18 Cooper, I take it, Dr. Cooper, that if we had asked
19 you that question six months ago, you would have had
20 to answer in the negative because you would have said
21 that the scour problem under ice jams was unsolved.

22 WITNESS COOPER: That's right,
23 a maximum or conservative solution had not been
24 finalized. The techniques had been finalized to attain
25 that solution.

26 Q Yes, you would have said,
27 I take it, six months ago that there was more you
28 needed to know before you could approve this preliminary
29 design.

30 A Before I was certain that

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Hardy, Williams
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1
2 we could design it at that particular location, yes.

3 Q Yes. I guess Mr. Genest
4 can take some satisfaction in the fact that I've
5 delayed the hearings to this date.

6 (LAUGHTER)

7 MR. GENEST: Some day my friend
8 will get tired of that tune but I will be patient.

9 MR. SCOTT: Now, let me turn
10 to one other question that is perhaps connected. Are
11 any members of the panel familiar with Dr. Casa-
12 grande's article on, "The role of the calculated risk
13 in earth work and foundation engineering"? Anybody?
14 Would you hold up your hands? Well now, I'd like
15 to read for the panel but before doing that I take it
16 that there is no doubt that Dr. Casa Grande is an
17 eminent geotechnical man on this continent, is there
18 any doubt about that?

19 WITNESS CLARK: No doubt
20 whatsoever, no.

21 THE COMMISSIONER: Well, who
22 is he so that the rest of us --

23 (LAUGHTER)

24 MR. SCOTT: Well, perhaps
25 Dr. Morgenstern or Dr. Hardy can tell us who he is,
26 before I read.

27 WITNESS MORGENSTERN: Professor
28 Casagrande is now a Professor of meritus
29 at Harvard University, and one of his students is
30 Dr. Hardy.

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Q Well, that's enough, I

would have thought. Well now, let me read one or two
passages from this --

MR. GENEST: Could we have the article more precisely identified? Where is it, when is it, what is the date; was it written in 1930 or yesterday?

MR. SCOTT: It's the -- I hope I pronounce this correctly -- it's the Terzaghi Lecture, is that correctly pronounced? T-E-R-Z-A-G-H-I which is reported in the Journal of the Soil Mechanics & Foundations Division proceedings of the American Society of Civil Engineers for July, 1965, and it begins at page 1 of that particular proceeding volume.

MR. GENEST: May I have the title again, Mr. Scott?

MR. SCOTT: Yes.

"The Role of the Calculated Risk in Earth Work
& Foundation Engineering."

Now, let me read two passages, I hope I don't do any injustice to the article by excerpting them.

MR. GENEST: May I have a copy of that when you're finished?

MR. SCOTT: Yes, you may have the copy. I find it inconceivable that I'll ever have occasion to refer to it again.

MR. GENEST: It wasn't on your list of documents. I should object.

MR. SCOTT: It's as you have said, Mr. Genest, on many occasions, it's a published paper and we don't have to refer to it on one's list. The author is talking about the expression "calculated

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1
2 risk" as used by engineers -- I think he's speaking
3 primarily of soil engineers in this article, and he
4 says this:

5 "This survey,"
6 that is a survey he made by mail of a number of his
7 colleagues,

8 "and my own observations show that the term
9 'calculated risk' is indeed widely used in
10 engineering, if not somewhat loosely, and that
11 usage and most suggested definitions have in
12 common a meaning that includes the following
13 two distinct steps:

14 (a) the use of imperfect knowledge guided by
15 judgment and experience to estimate the probable
16 ranges for all pertinent quantities that enter
17 into the solution of a problem;

18 (b) the decision on an appropriate margin
19 of safety or degree of risk taking into con-
20 sideration economic factors and the magnitude
21 of losses that would result from failure."

22 And he goes on to say,

23 "I have used the word 'calculated risk' as
24 meaning that in this paper."

25 Now is there anybody on the panel who disagrees with
26 that as an appropriate definition for "calculated
27 risk"?

28 WITNESS HARDY: I have no
29 objection to that.

30 WITNESS MORGENSTERN: I have

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1
2 -- I find it slightly emotive. We have another
3 philosophy that we like to cite for geotechnical engineer-
4 ing called the observational method, and which
5 alludes to the same two principles and illustrates that
6 by making cogent observations and employing flexibility
7 in our design philosophy such as implementing a design
8 change manual, we then get rid of the vaguaries of
9 nature or at least reduce their impact.

10 Q But I take it, Dr.
11 Morgenstern, that you don't object per se to the
12 two principles --

13 A No.

14 Q -- that Dr. Casagrande
15 set out as being within calculated risk.

16 A No.

17 Q And then, Dr. Casagrande
18 goes on to interpret the way calculated risk is utilized
19 in engineering, and one of the first things he points
20 out, he takes one example. If you build a substantial
21 dam there is a possibility that that dam may break and
22 be totally destroyed and effect considerable damage.

23 MR. GENEST:

Are you quoting now?

24 MR. SCOTT: No, I'm simply
25 putting that as one of the examples that's contained
26 in there; and then there is a lesser example, the
27 example of the construction, let us say, of some road-
28 way that may break down and cause less catastrophic
29 damage. Now are you engineers familiar with the propo-
30 sition that in calculating the risk you bear in mind

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1 the measure of damages that may flow if the risk, as
2 sometimes happens in life, occurs? Is that an accept-
3 able proposition?
4

5 WITNESS HARDY: Well,

6 when you say you calculate the risk, I mean to
7 say this is not the type of calculation that you do
8 when you calculate the thickness of pipe required or
9 when you calculate the amount of frost heaving that
10 may take place, it's more a concept than it is a
11 calculation. You're not suggesting that I take out my
12 slide rule and-- Q But reverting to the
13 definition --

14 A -- calculate the risk,
15 are you?

16 Q But reverting to the
17 definition, Dr. Casagrande says that one of the
18 components of the calculated risk is the decision that
19 is made on an appropriate margin of safety, taking into
20 consideration the magnitude of losses that result from
21 failure. In other words, there are some projects that
22 are designed more conservatively than others.

23 A That's right.

24 Q Because of the magnitude
25 of losses.

26 A I think the only difference of
27 opinion here
28 is that he's suggesting a qualitative assessment, not
29 a quantitative assessment.

30 Q All right, I accept that,
but I take it that all panelists are familiar with the

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1 concept whereby you measure the margin of safety or
2 determine the margin of safety, in part against the
3 potential for damage that may flow if the risk
4 occurs, is there any doubt about that general proposi-
5 tion?

6 A Well, it's not -- again,
7 you see, what Dr. Arthur Casagrande is doing here is
8 he's presenting his philosophy, philosophy of design,
9 you see. A person might design 50 dams, which he has
10 done, and he's never considered this sort of thing at
11 all. In other cases he has.

12 Q Well, let me revert to
13 the problem because I take it from what the panel has
14 told us earlier that this very consideration has been
15 applied in the design for this pipeline insofar as
16 twinning the rivers are concerned. You have measured
17 the risk to the owner, of damage, and it is cataclismic
18 in terms of losses and repair problems, and you have
19 therefore vastly expanded the margin of safety by
20 twinning those crossings. Now there is nothing odd
21 about that prospect, is there?

22 A I better let Dr. Clark
23 answer this.

Witness Clark: Go ahead.

24 Witness Hollingshead: No, I think
25 that's a fair statement.

26 Q And I take it each of
27 you within your own disciplines would recognize that
28 that kind of decision has to be made by each of you
29 as you approach the question of slope stability or
30 frost heave or river crossings. That kind of judgment

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has to be made. How conservative should we be, bearing in mind the potential loss?

WITNESS CLARK: The degree of conservatism relates to the stage of design.

Q Yes, you're going to become less conservative as you go along, Dr. Clark. Let's talk about it now when you're at the most conservative stage. I take it --

A We're not certain, of course, that we're going to become less conservative.

Q No, indeed, the history has been ironically that you've become more conservative as you've gone along, haven't you? You're no longer digging a 4-foot trench, you're now digging a 10-foot trench.

A I don't ever recall when we planned to dig a 4-foot trench or even a 6-foot; the minimum code is to cover, as I understand it, 2.5 feet and there are certain terrain conditions where that's quite appropriate.

Q I'm sorry, I didn't understand that you always asserted that you would dig to ten feet.

A Our feeling in the geotechnical area has always been that from our point of view that the deeper, the better, and --

Q Well, may I then see if I can get back to the proposition that I was trying to make, that each of the experts in his own field of

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1 expertise is aware and is obliged to make a judgment
2 measuring the margin of safety against the prospect of
3 damage or loss? Does anybody disagree with that?

4 A No, I don't think so.

5 WITNESS HARDY: Well, I find
6 it difficult to accept that as -- I'm sorry -- I find
7 it difficult to accept that as a basic engineering
8 procedure, you see, in the average situation. You
9 never sit down and put that on a piece of paper, for
10 example.

11 Q You may --

12 A And neither does Arthur
13 Casagrande.

14 Q You may not put it on a
15 piece of paper, but I put it to you, Dr. Hardy, that
16 that's a thing that an engineer religiously does in
17 determining to make a design more conservative rather
18 than less conservative, he bears in mind the risk of
19 loss or damage.

20 A In some situations.

21 Q I put it to you in every
22 situation.

23 A No sir, I cannot agree.

24 I'm saying on the situation of the stability of a slope,
25 you see, we don't go at that on the basis that well,
26 we can let this slope fail and there will be a certain
27 risk. We want to be able to analyze the slope to give
28 a safe pipeline. The question of risk doesn't come into
29 it at all, we want it safe or fail. Now there are other
30

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1 situations where this is not true. If we find that we
2 can't handle the stability problem for slopes, in perma-
3 frost, then we are in the sort of situation that you're
4 contemplating, up to a degree.

5
6 Q Well, apart from Dr.
7 Hardy, is there anybody who disagrees with the proposi-
8 tion that I've enunciated?

9 WITNESS CLARK: I would concur
10 with Dr. Hardy's assessment of that.

11 Q Well, let me put this
12 proposition to you, Dr. Clark, that if you decide to
13 construct a pipeline across the base of a slope, you,
14 I take it from what Dr. Hardy has said, you analyze
15 carefully the stability of that slope, that's the first
16 step, isn't it?

17 A That's correct.

18 Q Yes, you then make a
19 judgment about its general stability or not.

20 A That's correct.

21 Q Yes, you then measure
22 whether there is any risk that your judgment may be in
23 error.

24 A That's correct, that
25 would be based on our input information.

26 Q Yes, and if there is any
27 risk you then do whatever you can to make the most
28 conservative design so that if the risk occurs the
29 damages will be minimal.

30 A That's correct. If the
slope could not be avoided by routing, and there was a

Clark, Hollingshead, McRoberts,
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Hardy, Williams
Cross-Exam by Scott

1
2 potential for instability we would stabilize
3 it.

4 Q Yes, well wouldn't you
5 agree with me that what you are doing in that exercise
6 is you are measuring the potential damage or risk of
7 loss as against the necessity to be more or less
8 conservative in a given case.

9 A We're assessing the
10 stability of the slope, and if it is not stable we would
11 design measures into that slope that would make it
12 stable.

13 Q I see. Well, let's deal
14 with the building in of the measures, if I may just
15 for a moment, Dr. Morgenstern. I take it that there
16 are a variety of measures that you can build in, some
17 that are more conservative than others.

18 WITNESS MORGENSTERN: That's
19 correct.

20 Q I take it that in decid-
21 ing which of those measures to apply you would bear
22 in mind the risk of loss, or the risk of damage.

23 A The safety of the
24 slope, the stability of the slope.

25 Q Yes, yes, but I take it
26 that you measure the nature of the remedy against the
27 potential damage.
28
29
30

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Hardy, Williams
Cross-Exam by Scott

1
2 WITNESS CLARK: I'm finding that
3 difficult to follow. If the slope could affect the
4 pipeline, we have to live in harmony with the environ-
5 ment and if the slope would affect the pipeline either
6 directly, by imparting stress to it, or by exposing it
7 to erosive forces that could ultimately affect it,
8 we would design it so that it would not fail.

9 Q Yes, well I understand
10 your first observation to be with respect to river
11 crossings, that the prospect of a river crossing
12 failing is extremely remote.

13 A I believe that the
14 statistics show that the failures in river crossings
15 are less than failures that occur elsewhere.

16 Q All right, so it's one
17 of the most remote failures that is potential.

18 A Statistically I think
19 that's correct.

20 Q Yes, but you've also
21 said earlier that the risk of damage, if there is that
22 remote risk occurring, is very, very large.

23 A I don't believe it's the
24 risk of damage, it's the loss of revenue that would
25 occur.

26 Q The loss of revenue
27 which I include in the risk of damage, it is the loss that
28 is suffered.

29 A The loss --

30 Q And that loss would be

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Scott

1
2 extremely large --

3 A Compared to the cost of
4 the twin line, yes.

5 Q Yes, and as a result
6 you make a judgment and go to one of the most conser-
7 vative designs you can, which is the twin.

8 A That was, my understand-
9 ing is that that judgment was made by risk analysis
10 people on the basis of revenue, not on the basis of
11 an engineering consideration. It was not our recommen-
12 dation.

13 Q Well, don't you agree
14 with me that they are doing exactly the thing that
15 Professor Casagrande says they should do? They are
16 measuring the risk of loss and saying, "The risk is
17 so great that the safety factor, even though it may
18 not even avail, should be built in."

19 A I don't, for instance,
20 buy life insurance to protect my health.

21 Q Well, what has that to
22 do with it?

23 A Well --

24 Q I don't understand your
25 point.

26 A Well, this is in there
27 as insurance, is my understanding.

28 Q Well, would you agree
29 with me that what you have done then is that you have
30 made a decision as to the potential damage, and judged

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Hardy, Williams
Cross-Exam by Scott

1 it to be very large? That's the first thing you've
2 done.

3 A Our decision with respect
4 to twinning the crossings has been to make a recommen-
5 dation as to where and how they are twinned.

6 Q Yes, but that is the
7 most conservative design that you could possibly achieve
8 isn't it, or one of the most conservative, to run
9 two pipelines across the river?

10 A I'm not sure if that's
11 the most conservative one. That would be the risk
12 analysis people that could tell you that.

13 Q Who are your risk
14 analysis people?

15 A I'm not even sure of that,
16 but I know a risk analysis study has been done and out
17 of that came, to my understanding, a decision to twin
18 certain crossings.

19 Q All right, well let me
20 go back to the beginning. Do you agree as a general
21 proposition that this kind of judgment would be made
22 when building a dam, for example?

23 A What kind of judgment
24 is that?

25 Q A judgment that Professor
26 Casagrande talks about, a calculation of the risk and
27 the engineering decision to protect or if you
28 want, ensure against that risk?

29 A I think, as Dr. Hardy
30 says, in some cases it would be but no doubt Dr.

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Hardy, Williams
Cross-Exam by Scott

1
2 Casagrande has designed many dams where he hasn't
3 made that type of decision.

4 Q Dr. Morgenstern, I
5 think, has been anxious to get the microphone.

6 WITNESS MORGENSTERN: I think
7 that perhaps another dimension of this should be a
8 recognition of performance criteria. For example,
9 instead of talking about a dam, we're talking about
10 a nuclear power plant, our instructions from the owner
11 would be that there shouldn't be any failure and all
12 design must be towards any failure, of any conceivable
13 kind.

14 Q All right.

15 A So that I think perfor-
16 mance criteria should be perhaps introduced here.

17 Q Well, let me ask then
18 this question. How have the owners of this pipeline
19 graded it? Is it to be the most secure pipeline with
20 the most conservative design features, or is it not?

21 WITNESS CLARK: Well, our
22 charge is to design a safe and secure pipeline with
23 the least environmental impact.

24 Q No, but what does that
25 mean apart from a sort of motherhood statement? What
26 does it mean? Obviously there are trade-offs. You can
27 do certain things that cost more money which make it
28 marginally more secure. Have you done all those things?

29 A We have done a great
30 number of these. For instance, we have re-routed in

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Hardy, Williams
Cross-Exam by Scott

1 many areas to greatly increase the length, and the cost,
2 to for instance avoid an area where there might be a
3 major impact on the terrain. We have also done it for
4 wildlife, to avoid an area where there is -- our
5 wildlife consultants felt that there might be an
6 impact on wildlife.

7
8 Q Well, let me then ask
9 all the panelists this, just so we'll see if we
10 agree. Is it your position for each of your own
11 disciplines that this is the most conservative pipeline
12 design?

13 MR. GENEST: Well, Mr.
14 Commissioner, I just fail to see how that question
15 gets us anywhere.

16 MR. SCOTT: Well, it may be
17 that it doesn't.

18 THE COMMISSIONER: Well, that
19 isn't a basis for an objection. Is it relevant or
20 irrelevant?

21 MR. GENEST: Well, I don't
22 think it's understandable. The most conservative, what
23 is the most conservative design?

24 MR. SCOTT: Well, that's
25 precisely, Mr. Commissioner, the kind of question--

26 MR. GENEST: You would have five
27 pipelines running side by side and protected by tanks
28 at every five miles.

29 MR. SCOTT: Oh no.

30 MR. GENEST: The words, "most
conservative" in my submission, is meaningless,

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

1
2 without some more precise definitions. So in my
3 submission it's not a proper question.

4 MR. SCOTT: Well, Mr. Commis-
5 sioner, I was perhaps misled by the article, but the
6 article which I will file with the Commission so my
7 friend can have it, indicates that -- and it may be
8 that this panel doesn't agree with it -- but it indi-
9 cates that one decision that is made is a decision as
10 to an appropriate margin of safety, taking into con-
11 sideration the magnitude of losses. Now, and then
12 Professor Casagrande goes on to show how losses may
13 differ in various kinds of projects from a dam which
14 will wipe out a village to a highway which will simply
15 have to be re-paved in two years; and the margin of
16 safety or security varies. Now, what I would like to
17 get from this panel is how they would grade this
18 project in terms first of all of the margin of safety.

19 WITNESS HARDY: Well, I don't

20 --

21 MR. SCOTT: I don't know if
22 my friend now understands the question.

23 MR. GENEST: It's a different
24 question.

25 MR. SCOTT: No, no, the
26 expression --

27 MR. GENEST: At any rate I
28 have no objection to the question.

29 WITNESS HARDY: It's very
30 difficult to answer. It really is almost impossible

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Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

1 to answer because you don't look upon these things in
2 terms of margin of safety, in the actual physical
3 design of the pipeline. The location is not selected
4 in the first instance on the basis that if we put it
5 here there is so much risk, if we put it here there is
6 a percentage less risk. The location is put where the
7 consensus of the best judgments we can get is that this
8 is the best location.
9

10 MR. SCOTT: From what point
11 of view?

12 A From the general overall
13 -- all of the factors involved.

14 factors
15 Q Well, what/are you talking
16 about?

17 A From the building, all
18 of the things that have been discussed here for the
19 last month. It's all of the factors that are involved
20 in the location, the construction and operation of
21 the pipeline. You put these all together with a group
22 of people and come up with a location, and you don't
23 assess that, "If we go somewhere else that that is
24 -- that there's a risk of X percentage," whatever you
25 may say, it's what the consensus of the people concerned
26 is the best location.

27 Now in the case of your river
28 crossings, you see, the difference there is that there
29 is no assessment made in terms of the risk of failure.
30 The thing there is, and the odds are terrific, if a
failure did occur the -- involved in the loss of revenue

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Hardy, Williams
Cross-Exam by Scott

1
2 is the major point is that it will take maybe months
3 to get that line back into operation in the river
4 crossing, where a break most other places would be
5 fixed up in a matter of days. So the odds there, you
6 see, are very, very extreme.

7 Q I take it from that
8 example therefore that the margin of safety or insur-
9 ance, if you will, which leads to twinning, is not
10 built into a pipe that is going to cross a slope that
11 maybe unstable, because it can be repaired.

12 A It might not be, and
13 quite legitimately so, because if it did fail there
14 may be exactly the same risk, you see, and because
15 you don't do it on the slope does not mean that you're
16 increasing the risk. You may have exactly the same
17 hazard on the slope as you have in the river crossing
18 and as far as the designer is concerned he thinks he's
19 got a proper job and there will be no failure.
20 But if you assume the condition where there is a fail-
21 ure, then in the case of the slope it is a matter of
22 hours as compared to months, maybe.

23 Q Well then, may I approach
24 it this way, having taken the definition that Professor
25 Casagrande has given, are any of you, for the record,
26 aware of any calculated risks inherent in the design
27 of the project at this stage?

28 WITNESS MORGENSTERN: Yes, as
29 someone who has guided to some degree some of the design
30 criteria, it's certainly been my view and adopted view

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Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

1
2 that under any conceivable situation the integrity of
3 the pipe cannot be in doubt. We have also --

4 Q Excuse me, the pipe
5 cannot what?

6 A The integrity of the pipe
7 cannot be in doubt. The pipe is designed safely against
8 any conceivable situation we've thought of, and con-
9 servatively. I, however, can conceive of some environ-
10 mental setting, some slides that might occur and where
11 we would regard this as a maintenance problem; but this
12 would only be a location where one could get at access,
13 where one would evaluate that remedial works could be
14 undertaken and where the slide would be of such magni-
15 tude that it would not upset the pipe. So in that
16 sense there are calculated risks.

17 Q Well then, perhaps
18 Dr. Morgenstern, you're not typical of the panel, or
19 perhaps you are, I don't know. Do I understand you
20 to say that your judgment, insofar as your expertise
21 and your design advice is concerned is that the most
22 conservative design has been provided in terms of
23 pipe integrity?

24 A No, that's not what I
25 said.

26 Q I'm sorry.

27 A I'm afraid I must share
28 Mr. Genest's concern. Clearly, one might
29 bury a pipe 100 feet deep and then end up --
30

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Scott

Q All right. A conservative design has been achieved insofar as pipe integrity is concerned.

A Yes.

Q Now do each of you for your expertise accept that proposition? If anybody doesn't; I take it everybody does.

WITNESS HARDY: What do you mean by conservative?

Q Well a design function that will in all cases, Dr. Morgenstern has said, protect or insure the integrity of the pipe

A I agree with that.

Q Allright.

WITNESS COOPER: I've got to ask one question here. Are you talking about conservatism of all the preliminary designs?

Q Are you at the moment prepared to say that the integrity of the pipe is assured by the design?

A What do you mean by "the design"?

Q What you've been doing with respect to designing features for river crossings and so on.

A With respect to the knowledge, the information that will be obtained for final design, yes-

Q What will be obtained do now, what/you say about your design solutions now?

A Well, on a site specific basis, for example, the preliminary designs of

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

1
2 river crossings that are contained in some of the
3 documents, we must keep in mind that the purpose of
4 the exercise there was not to generate conservative
5 final designs. The purpose of the exercise was to
6 generate preliminary designs that could be used as the
7 basis of cost estimating, that could be used for the
8 basis of designing data collection programs.

9 Q Yes, but Dr. Cooper,
10 perhaps I'm mistaken but I understood you to say
11 earlier that those design solutions for river crossings
12 were conservative. You used that word and got me into
13 this trouble.

14 A No, what I said earlier
15 that I said was conservative was the estimate for
16 one single crossing of a scour depth, and that's the
17 crossing at Point Separation.

18 Q Well, how do you rank
19 the others in terms of safety as compared with that
20 one? Are they more conservative in that context, or
21 less?

22 A I can't say more or less
23 because they have not gone through the final review
24 process. Had they -- if we were to go through that
25 final review process on some of these preliminary
26 designs we might well find that some of them are under-
27 conservative.

28 Q You mean not conservative
29 enough?

30 A That's right. However,

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

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2 we must keep in mind that the objective of those
3 designs was not to produce conservative designs.
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Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

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2 Q Perhaps there is a
3 difference in the way the various disciplines have
4 approached it from, because I understand Dr. Morgenstern
5 to say, for his area, that his designs were designed
6 to achieve the integrity of the pipe. Is that correct
7 Dr. Morgenstern?

8 WITNESS MORGENSTERN: A Yes,
9 but one could rephrase Dr. Cooper's work and
10 achieve some unanimity. He has presented and the
11 various documents presented a design methodology, which
12 when you select site specific parameters for a specific
13 crossing can achieve a conservative design. It is not
14 the same as saying that specific design on a preliminary
15 basis is conservative at this time. The thing to
16 evaluate is the total design methodology that's been
17 presented.

18 Q Well, does Dr. Cooper
19 accept that his design methodology will achieve a
20 conservative design that will insure the integrity of
21 the pipe?

22 WITNESS COOPER: A The
23 methodology, yes.

24 Q Yes. Well now, what do
25 you understand by methodology in that context?

26 A By methodology, I mean
27 the techniques that will be used to achieve final
28 design, the data that will be used to develop these
29 final designs.

30 Q Well now, at page 32 of

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Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

1
2 his article, Dr. Casagrande divides risks into two types
3 engineering risks, and human risks. And the human
4 risks are unsatisfactory organization, unsatisfactory
5 use of available knowledge and corruption, and we'll
6 leave them aside.

7 He divides engineering risks
8 into two types: unknown risks, and calculated risks.
9 With respect to our known engineering risks he comments,
10 I suppose obviously, "by definition, such risks cannot
11 be identified until they reveal themselves by failure
12 or other event that can be occurred--that can be observed
13 and investigated." Then with respect to calculated
14 engineering risks he lists a number of them as they
15 apply to soil mechanics problems within his particular
16 area. He Lists for example the effects of earthquakes
17 on high earth and rock-fill dams, stability characteris-
18 tics/offhighly plastic stiff clays and clay shales, and
19 so on.

20 Now, what I would like to
21 know, if it's not a naive question, is have each of
22 you in your discipline taken calculated engineering
23 risks of that type in posing design solutions?

24 MR. GENEST: Mr. Commissioner,
25 I'm sorry to interrupt my learned friend Mr. Scott, who
26 has got a lot of experience in cross-examining by the
27 method of using the works, the published works of an
28 expert. My submission is not following that procedure.
29 The procedure that I think I submit is proper, is to
30 put the quotation directly to the witness, and ask him

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

1
2 if he agrees or disagrees. And my learned friend is
3 not following that procedure at all. It is very
4 difficult for this panel to deal with Mr. Scott's
5 condensations of that learned author's points, and put
6 questions that seem to me sometimes unrelated to the
7 point the author is making.

8 MR. SCOTT: Oh, I'll accept
9 that Mr. Commissioner. Let me ask, does the panel
10 accept Dr. Casagrande's division of engineering risks
11 into unknown and calculated risks? Anybody disagree
12 with that?

13 WITNESS HARDY: A I'm not
14 at all sure that I would agree with that in the
15 context of this pipeline.

16 Q Do you agree with it in
17 other context?

18 A In some context.

19 Q How does it differ as
20 far as this pipeline is concerned?

21 A Well, this -- as far as
22 I'm concerned this pipeline is in the context of
23 previous pipelines that have been built in Northwestern
24 Canada. And to a certain extent elsewhere. And
25 certainly what is going on in Alaska now, you see.
26 We have a permafrost condition which we analyzed that
27 in the terms of the period in Canada where permafrost
28 has been recognized at least to the point where it was
29 considered that it needed some engineering attention.

30 Now, in the case of Arthur

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Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

1
2 Casagrande's paper there, I happen to know the context
3 in which he wrote that paper --

4 Q I don't want to interrupt
5 you Dr. Hardy, but do you agree in the context of
6 pipelines with his division of the two kinds of
7 engineering risks?

8 A No.

9 Q Why not?

10 A Because I don't think
11 the situation is at all comparable to the situation
12 that he is talking about.

13 Q I see. How would you
14 characterize risks associated with pipelines?

15 A I characterize them--

16 Q He set up a classification,
17 what's yours?

18 A -- in terms of my experience
19 with pipelines, and I think that with the type of
20 thing that can go wrong, you see. One area in which
21 I think might be useful to you in trying to pin us
22 down on what we are meaning by what risks we've taken
23 and so on, when Dr. Cooper has a reservation as to how
24 conservative his design of the pipeline, of a scour
25 depth is and so on, I do make a mental observation or
26 a mental analysis on a qualitative basis.

27 Okay, supposing that, and I
28 am not nearly as conservative on this point as Dr.
29 Cooper appears to be, so I make a qualitative judgement.
30 I'm not concerned about the failure of that pipeline

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams

Cross Examination by Scott

1 from scour to the same extent that he appears to be,
2 because there is some built in factor of safety, if you
3 like, on the performance of the pipeline.
4

5 If the pipeline is exposed, it
6 doesn't fail. I've seen many pipelines exposed in
7 rivers that don't fail. There is an additional 4 feet--

8 Q If one is exposed, it
9 has failed.

10 A What's that again, sir?

11 Q If this one's exposed it
12 may have failed in environmental terms?

13 A Why would it fail in
14 environmental terms?

15 Q Because it may do
16 environmental damage.

17 MR. GENEST: Well, if it may,
18 it hasn't failed, it only will have failed, if it will.

19 MR. SCOTT:

20 Q I'm sorry, I interrupted
21 you Dr. Hardy.

22 A Well, in any event, I
23 see in this situation some factors of safety that Dr.
24 Cooper is not taking into the picture.

25 Q Well, can I come back now
26 is there anybody besides Dr. Hardy on the panel who
27 disagrees with Dr. Casagrande's division of engineering
28 risks into two catagories unknown risks, and calculated
29 risks?

30 WITNESS MORGENSTERN: A Yes, I

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Cross Examination by Scott

1
2 think if we looked at the problem of classification of
3 risk, we would probably break it down first into known
4 and unknown, and then subdivide known risks. And I
5 suggest a three-fold classification between ignored
6 risks, calculated risks, which I will come back to,
7 and risks which dominate or considered risks, risks
8 which then control, controlling risks.

9 Q Right.

10 A The calculated risk I
11 think in the sense that Casagrande uses it, is a risk
12 that you take together with an emergency plan in case
13 things begin to happen, that's part of the calculation.
14 Does that help?

15 Q All right. Well, no,
16 that's quite satisfactory definition. It doesn't,
17 it seems to me that it's a refinement of Dr. Casagrande's,
18 wouldn't you agree, rather that a deviation from it?

19 A It seems sounder logically.

20 Q Does anybody else have
21 any qualifications they want to add on this division?
22 Well, now, Dr. Casagrande goes on, and I'm going to
23 ask your comment on this, with respect to pipelines.
24 "The margin of safety that we incorporate into our
25 structures should bear a direct relationship to the
26 magnitude of potential losses. And it must also take
27 into account the range of uncertainty involved. If
28 this range is very small, then we are approaching
29 problems in engineering which are resolved by the use
30 of a conventional factor of safety. When the range

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

1
2 is large we cannot usually express the results in terms
3 of the numerical factor of safety, we then speak of the
4 margin of safety which is based largely on experience
5 and judgement."

6 Now, does that approach of Dr.
7 Casagrande's find favour with the panelists?

8 WITNESS MORGENSTERN: A No,
9 I think that this reflects one's experience and the
10 type of terrain that you work in. There are many
11 problems that Casagrande would say that you can't
12 quantify, that I would say you can, and vice versa.

13 Q Well, let me begin then,
14 Dr. Morgenstern assuming you are speaking for the
15 panel at this moment with this proposition. The margin
16 of safety that we incorporate into our structures
17 should bear a direct relationship to the magnitude of
18 potential losses. Do you accept that proposition?
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Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

1
2 are variable, along the pipe. Some locations of fish
3 breeding might be affected by slides, that would be
4 serious; other slides would not affect things much, that
5 would not be so serious. It's a broader spectrum.

6 Q Well, let me read the
7 next statement and we'll see if it applies to pipelines.

8 "It"(the margin of safety)"must also take into
9 account the range of uncertainty involved."

10 Do you accept that?

11 A Yes.

12 Q And does the rest of the
13 panel accept that? And do you agree that that is a
14 consideration that should apply in this kind of case?

15 A Beyond any doubt.

16 Q Yes, and I take it that
17 you would agree, though you are perhaps not an environ-
18 mentalist, that the element of uncertainty relates not
19 only to the integrity of the pipeline but relates to
20 the environmen_tal impact it may have?

21 A Recognizing the different
22 dimensions which one is working with.

23 Q And then do you accept
24 this proposition:

25 "If the range is small, then we are approaching
26 problems in structural engineering which are
27 resolved by the use of a conventional factor;
28 when the range is large we then speak of a
29 margin of safety which is based largely on
30 experience and judgment."

Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

1
2 A The range of what? I'm
3 sorry.

4 Q When the range is large,
5 that is the range between the magnitude of potential
6 losses and the margin of safety.

7 A Sorry, Mr. Scott, I
8 can't -- I have lost you.

9 MR. GENEST: Mr. Commissioner,
10 may I interject here? Mr. Scott is obviously mounting
11 quite a set piece attack based on this article. It's
12 very difficult, in my experience, if a text or a writing
13 of an author is to be the basis of a cross-examination,
14 in fairness to the witness it would require that the
15 witness should have a copy of that in front of him.
16 It's very difficult when we read a whole paragraph and
17 are unable to judge the shades of meaning that may be
18 involved in that, for the witnesses to give a proper
19 answer, or considered answer, with respect to these
20 matters of engineering philosophy. My suggestion
21 would be that if Mr. Scott is going to go on at length
22 from this article, that the panel be provided with
23 a copy of the article.

24 MR. SCOTT: I see nothing
25 wrong with that. I didn't realize that Professor Casa-
26 grande would attract the fire that he apparently has.

27 MR. GENEST: I didn't realize
28 he would attract the attention he's got for the last
29 hour.

30 MR. SCOTT: Well, my concern,

Clark, Hollingshead, McRoberts,
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Hardy, Williams
Cross-Exam by Scott

1
2 Mr. Commissioner, derives from, of course, the testi-
3 mony that my friend has elicited, that depending on
4 the terminology used, this is a most conservative
5 design or this is a design that assures the integrity
6 of the pipe, and my concern is to plumb the dimension
7 of that margin, and I'd be happy to provide my friend
8 with a copy of this article because I want to continue
9 to refer to it. Perhaps I can go back, however,
10 without a copy of it, to Dr. Morgenstern, and try and
11 read him this sentence and he begins:

12 "When the range is large,"--

13 MR. GENEST: The range in
14 what, Mr. Scott?

15 MR. SCOTT: Well, I'm coming
16 to that, and I think "the range" refers back to the
17 element of uncertainty.

18 When the range of un_certainty "is large, we
19 cannot usually express the results in terms
20 of a numerical factor of safety. We then
21 speak of a margin of safety which is based
22 largely on experience and judgment."

23 WITNESS MORGENSTERN: The
24 factor of safety has a very special meaning to geo-
25 technical engineers, it's a quantitative criterion
26 used in design, and the other term that you cite,
27 "the measure of safety" or something like that.

28 Q Margin of safety.

29 A Margin of safety, is not
30 as precisely defined. It's just words that you're

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

1
2 quoting. My own practice, I've been happy with using
3 factors of safety even when the range of uncertainty
4 is large, but the factor of safety adopted in design
5 reflects that range, which is one of Casagrande's
6 points.

7 Q Well, let me put this
8 general proposition to you, Dr. Morgenstern, for the
9 panel at this moment. Anybody who disagrees can inter-
10 vene, I presume. In this particular project, there
11 will be the usual number of unknown or unidentified
12 risks, isn't that fair?

13 A If I might cite a
14 story about nuclear power plants, which have been the
15 subject of great concern. I asked a colleague who has
16 worked a great deal on these things if he's absolutely
17 sure that they're safe, and whether he's happy about
18 design; he has said that he's absolutely delighted
19 with everything they've thought about, but he's
20 terrified about the things they haven't thought about.
21 In that sense, there may be unknown things we don't
22 know about.

23 Q All right. I take it
24 that the prospect for unknown things increases with
25 the novelty of the project.

26 A It increases with
27 scale, which is a factor which we might bear in mind
28 with this project, it's a big pipeline. Certainly it
29 generates new problems.

30 Q Yes. I take it that

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

1
2 what you're saying is the size of the pipeline-- not
3 48 inches, but the length from top to bottom --

4 A And 48 inches.

5 Q -- and 48 inches --

6 A Pressure.

7 Q -- generates unknown
8 risks.

9 A Generates new concerns,
10 design problems that have been identified.

11 Q Yes, and also raises the
12 prospect that there are others that may not have been
13 identified. Is that fair?

14 A There are possible
15 unknowns.

16 Q Yes.

17 And I take it that the
18 possibility of unknowns increases when the project
19 has novel features, not only in dimensions but in
20 technique.

21 A Yes, generally.

22 Q And wouldn't you agree
23 with me, speaking generally therefore, that the number
24 of unknown risks is probably greater in this kind of
25 project than on a project which -- for which there are
26 many precise precedents?

27 A Except if this certainly
28 were a proposal to do this pipeline like we've
29 done pipelines in Southern Canada, without studies,
30 that would unquestionably be true; but you must

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
CrossExam by Scott

1
2 remember that there have been something like 70-80
3 large numbers of millions of dollars invested in
4 research and study to eliminate those risks, and that's
5 our position here.

6 Q Well now I propose --
7 and perhaps it will end the day -- to ask each of the
8 panelists if in his design solution in his area of
9 expertise, he has consciously calculated any risks in
10 terms of the integrity of the pipeline, or if it's
11 within his expertise, the integrity of the environment?
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Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

1
2 What does the team of McRoberts and Morgenstern say
3 with respect to that?

4 WITNESS MORGENSTERN: If I
5 might go first, I repeat that all of the design
6 criteria that I have recommended and have seen adopted
7 and reviewed with my colleagues are directed towards
8 ensuring the integrity of the pipe, and also satisfying
9 an economic environment.

10 Q Have you taken any
11 calculated risks in your design solution?

12 A In the sense of
13 Casagrande, no, we really haven't, because let's say
14 with regard to the integrity of the pipe, let me
15 single on that. That as a calculated risk in the sense
16 that you contemplate a failure might occur and then you
17 have a scheme to come in and fix it up, and that's part
18 of the design at the outset. It's just not within
19 economic or engineering or client terms of reference,
20 it's precluded from our considerations. On the other
21 hand, there are calculated risks or I anticipate seeing
22 calculated risks being taken with regard to the odd
23 landslide which would not intrude environmentally, and
24 not intrude on the integrity of the pipe. I think this
25 is an important distinction to bear in mind.

26 Q Well, I am not sure how
27 we end up then on my question. I take it that you have
28 taken no calculated risk --

29 A No important ones.

30 Q -- no -- well what's the

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

1
2 measure of your importance, the integrity of the pipe
3 or the environment?

4 A The integrity of the pipe
5 and areas of environmental sensitivity or areas that
6 would be difficult to fix in case -- to go back to
7 slides -- in case a slide took place.

8 Q All right, so would it
9 be fair to say for you, Dr. Morgenstern, that you
10 have taken no calculated risks in your design solu-
11 tions except in cases where remedial remedies are
12 economically feasible?

13 A No, and environmentally,
14 it has to be an area that you can get at with some
15 ease.

16 Q All right, is that the
17 only qualification you make?

18 A Yes.

19 Q Dr. McRoberts, do you
20 agree with that?

21 WITNESS McROBERTS: Yes, I
22 would say that as far as the integrity of the pipeline
23 is concerned, the designs that we proposed / ^{would be} suitably
24 conservative. There are some areas in regards to
25 environmental designs that the factor of safety we might
26 choose to use would differ, for example if I talk to
27 one of the fish biologists about stream crossings and
28 he indicated to me that that stream down there was
29 a very important ^{bream} stream and he didn't want any silt
30 in it, I would tend to take the point of view on a

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Scott

1
2 judgment basis the factor of safety that I'd want to
3 use would be slightly higher than the factor of safety
4 that I'd want to use in exactly the same terrain type,
5 in exactly the same conditions that had no impact on
6 fish. There may be a bit of silt come down, but if
7 there was no impact on the pipeline and it was fixable,
8 and I felt that it was fixable then I would feel that
9 I could take -- if you want to use the term-- a
10 slightly different calculated risk. I wouldn't see it
11 as a calculated risk, I'd be more inclined to, as Dr.
12 Morgenstern mentioned initially, to follow what might
13 be called the observation method rather than the cal-
14 culated risk method, / ^{If one can} make a distinction; but I
15 would understand how a landslide would develop. If it
16 didn't affect the integrity of the pipe, then my
17 next level of concern is impact to the environment.
18 I suppose the final level of concern might be implica-
19 tions on your gas bill. I would not feel that it
20 would be my professional responsibility to advocate
21 designs that were grossly over-conservative. That would
22 serve no purpose. Q I'm not
23 sure that you clarified for my mind how you stand
24 then. Do I understand you to say that there are no
25 calculated risks in design solutions that affect the
26 integrity of the pipe?

27 A I don't think that if we
28 had to come up with designs right now that we would
29 -- there would be areas that we thought -- excuse me,
30 I'll start again. If we had to come up with designs

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Scott

1
2 at this period in time that we could design against
3 failure of the pipe; that's my position. I think in
4 some cases we would assess the environmental -- excuse
5 me, the environmental impact on a more incremental
6 basis. Perhaps a failure may occur along the right-of-
7 way after an exceedingly heavy rainstorm but there
8 would be hundreds of other ones occurring in the
9 vicinity of our pipeline right-of-way. It would be
10 over-conservative to design against that type of
11 consideration.

12 Q Well, are you being
13 over-conservative with respect to design for the
14 integrity of the pipe?

15 A No, I don't think we're
16 being over-conservative. I think we've been adequately
17 conservative to ensure a safe system.

18 Q All right, have you taken
19 any calculated risks in your design solutions, of
20 which you're aware that may have environmental
21 impacts?

22 A I don't think that I
23 take calculated risks in that sense that I had to
24 design at a given place. I would feel that the method
25 of analysis that I would use was the correct one, in
26 my judgment; I would select input parameters in the
27 model that I was using to ensure that there was no
28 failure.

29 Q Well, do I understand --

30 A Or I would take a factor

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper,
Hardy, Williams
Cross-Exam by Scott

1
2 of safety that was suitably adjusted, assuming a
3 given fact that I could fix it.

4 Q But what do you mean you
5 would take a factor of safety that was suitably
6 adjusted?

7 A Well, giving a case in
8 point, if one might have a situation where there might
9 be potentially some slope movement/and at the same
10 time we would also be building into our design observa-
11 tion techniques that we could monitor the system and
12 find out if something was developing. Now if we left
13 it alone we might be taking a calculated risk, we
14 would do something about it to ensure that we could
15 gain --

16 Q Well, do I understand
17 you to say then, whatever risks you have taken are
18 risks in areas that in your judgment present a suitable
19 arena for remedy?

20 A Yes.

21 Q All right. Now Dr.
22 Hollingshead and Dr. Cooper, do you feel that there
23 are any calculated risks inherent in any aspects of
24 your design solutions?

25 WITNESS HOLLINGSHEAD: I would
26 say that inasmuch as we haven't produced any final
27 designs yet, that we haven't taken any calculated
28 risk. But I would say that we do recognize that there
29 are areas which for instance, lateral migration, which
30 can be monitored and in that sense there may be a

Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

1
2 design which would recognize that, and if time is
3 available to come up with remedies before the pipe
4 becomes exposed.

5 Q Well, I'm not quite sure
6 that I understand what you've just said to me now.

7 A Well, in the final designs
8 --

9 Q Could I just interrupt
10 you for a moment? You tell me that you haven't come
11 up with any designs, so the question shouldn't really
12 be put to you. I take it you have come up with what
13 your colleague calls a design method --

14 A Methodology.

15 Q -- methodology, I was
16 wondering how many "Os" there were. Is that correct?

17 A Yes.

18 Q Are there any calculated
19 risks, any judgments as to calculation of risks that
20 you made in selecting that design methodology?

21 A The methodology allows
22 for one to incorporate remedial measures at some
23 time down the road where it may become necessary in
24 order to protect the pipe.

25 Q Do I understand that to
26 mean that insofar as the integrity of the pipe is
27 concerned, any risk is one that can be remedied if the
28 risk occurs?

29 A That's right.
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Clark, Hollingshead, McRoberts,
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross-Exam by Scott

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2 Q Is that true for you
3 too, Dr. Cooper?

4 WITNESS COOPER: Yeah,
5 it's -- you speak of calculated risk, I speak of degree
6 of conservatism. Do we mean the same thing?

7 Q Well, I'm hesitant of
8 that word again.

9 A I think we do.

10 Q It got me into trouble
11 with Dr. Hardy,

12 A I of course think of it
13 degree of
14 in terms of/conservatism and like Dr. Morgenstern
15 stated and like Dr. Hollingshead stated, the degree
16 of conservatism would be somewhat less in areas where
17 we could remedy and control the situation; should a
18 certain event develop such as the migration of a
19 bank.
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Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

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2 Q Well now Dr. Slusarchuk,
3 are there any calculated risks of which you've been
4 aware and made in the design solutions for which you
5 are responsible?

6 WITNESS SLUSARCHUK: A Sir,
7 I have not made the conscious calculated risks as you
8 are discussing them this afternoon. Judgement is always
9 involved. If judgement is a calculated risk, then I
10 guess that's part of it.

11 Q No, I don't think I
12 contemplated judgement as being a calculated risk,
13 What I'm really saying to you, are there any cases
14 where you have been concerned about the margin of
15 safety in terms of the integrity of the pipe?

16 A Sir, if you don't consider
17 judgement as part of the calculated risk, then I have
18 not made any conscious calculated risks, or consciously
19 taken any calculated risks.

20 Q Well, does that mean to
21 say that you are not conscious from what you have seen
22 or done that there is any risk in your area of
23 expertise that the integrity of the pipe will be lost?
24 That's a broad statement.

25 A Well, I am telling you
26 that I have not made any of those kinds of conscious
27 risk analysis, or, I forget the term you were using.

28 Q Well, let me put it this
29 way then. Is there any design solution within your
30 area of expertise, which raises in your mind the prospect

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Cross Examination by Scott
The Commissioner

that it may not, in some instances, resolve the problem?

And by the problem I mean, assure the integrity of the
pipe?

A No, sir with our overall
plan, I do not feel uncomfortable in saying that the
integrity of the pipeline can be maintained through
our designs.

MR. GENEST: Let's all take
a calculated risk and----

THE COMMISSIONER: Well, yes
certainly. Could I just ask a question before we
adjourn? Dr. Clark, you said a risk analysis study
has been done?

WITNESS CLARK: A That's my
understanding.

Q Yes, well who would have
done that study?

A That would have been
commissioned by Canadian Arctic Gas, and I'm not certain
as to who carried out that study.

Q At any rate, it wasn't
Northern Engineering?

A Not to my knowledge.

Q Well, would that be in
the nature of obtaining a second opinion?

A I don't believe it would
be. My understanding is that it was largely a statistical
assessment of past performance.

MR. GENEST: It's my understanding

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Slusarchuk, Morgenstern, Cooper
Hardy, Williams
The Commissioner

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2 and we can put that one in the Horte bag, but my
3 understanding sir, if it's of any assistance, is that
4 it was a financial analysis, measuring the cost of
5 twinning against the losses that could be expected
6 in revenues if the pipe was interrupted for a period
7 where you couldn't get at it on a major river crossing.
8 And the parameters were mainly financial, it was looked
9 at from an insurance underwriting point of view.

10 Q Could I ask you a
11 question Dr. Hardy? The, you said, that in respect
12 of some projects there would be no risk factor that
13 would be entertained. I take it that you were thinking
14 of a project such as the construction of a large dam
15 above a city, something of that sort? Did I understand
16 you, is that what you were saying?

17 WITNESS HARDY: A Well, I
18 was thinking at the other end of the spectrum, I think
19 sir, at the time. It was a very small structure. You
20 wouldn't be concerned with a risk at all. Of course
21 that is what Dr. Casagrande has said. He is concerned
22 with the problem that you have just posed. How
23 conservative are you in your design approach for the
24 situation such as you're talking about with a dam
25 above a city.

26 And he runs into this above
27 a heavily populated community. He has run into this
28 very frequently in his own experience on a world-wide
29 basis with dams. And this is a very important aspect.

30 In the case of the pipeline

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2 you see, the hazard to life doesn't approach that at all.
3 It scarcely exists almost with respect to that sort of
4 thing. And so the thing is that, my difficulty with
5 Mr. Scott is that he is asking me to admit to a design
6 procedure or a thinking in design that I have never
7 done with any pipeline that I have ever been concerned
8 with. And I can't recall any other type of project
9 that I have been concerned with.

10 I can honestly say to Mr.
11 Scott though, that in this case with my original
12 involvement, being asked by three different organizations
13 to give them advice on Arctic pipelines, that this
14 being the one that it has boiled down to, and this
15 may have been my greatest contribution, that is, I
16 realize that it was no longer, it would not be possible
17 to -- it was not a one man operation any longer from
18 a geotechnical point of view.

19 And realizing all of these
20 risks at that stage that Mr. Scott is talking about
21 you see, the answer that I gave to my clients was that
22 you set up an organization and make the proper studies
23 and spend the proper money and get other consultants.
24 And whether or not that was the right advice depends
25 upon your final assessment of this panel and others
26 that will be made.

27 So, I can honestly say to
28 Mr. Scott, that as far as this pipeline is concerned
29 if we want to assess its' safety or its' competence
30 in terms of geotechnical factors, in my experience

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The Commissioner

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2 it's safer than any pipeline that I have been connected
3 with, because there's been many hundreds of times the
4 amount of effort, hundreds of times the amount of
5 effort per mile of any pipeline I know of, other than
6 Aleyeska.

7 MR. SCOTT: Mr. Commissioner,
8 I think then perhaps my abortive efforts have not
9 failed, because the thing must be examined, in my
10 respectful submission, in terms of placing responsibility.
11 And now that that is carefully allocated, I would
12 propose to turn, and the responsibility is fully
13 accepted in each case, I would propose tomorrow if
14 you please to turn to some specific questions.

15 Before doing that, and
16 following your observation about risk studies to Dr.
17 Clark, Dr. Clark, isn't the dual river crossing
18 report of July, 1974 prepared by Northern Engineering,
19 the risk study? That was the report that listed the
20 incidence of failure and the potential remedies,
21 including twinning and then recommended the appropriate
22 remedy in view of the potential loss. Isn't that a
23 risk study?

24 WITNESS CLARK: A There was
25 a study of dual river crossings, and it attempted to
26 put some perspective to the possibility of loss. I
27 don't recall the details of it, but it was also
28 primarily concerned with the location of dual crossings.

29 Q Yes, but it analyzed the
30 potential damage and hypothesized certain solutions

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Slusarchuk, Morgenstern, Cooper
Hardy, Williams
Cross Examination by Scott

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2 for it?

3 A It made an estimate of
4 the length of time the pipeline would be out of service,
5 for a particular crossing.

6 Q Well, is that the kind
7 of document that you meant when you referred to risk
8 studies?

9 A No, I believe as Mr.
10 Genest said, that risk analysis per se was more on a
11 financial basis.

12 Q I see.

13 THE COMMISSIONER: Just one
14 last thing before we adjourn. Dr. Hardy, something
15 you said interested me, it has nothing to do with
16 Dr. Casagrande's article. You said that you were
17 looking, that is by you, I mean all of those connected
18 with the engineering of this proposed pipeline, you
19 were looking at it / ^{within} the context of the pipelines
20 already constructed in the Northwest, and no doubt one
21 of those you had in mind was the Pointed Mountain
22 Line.

23 WITNESS HARDY: A It wasn't
24 built at the time I first started this, but --

25 Q You also said you were
26 looking at it within the context of what was going on
27 in Alaska, and I take it you meant the construction
28 of the Aleyeska Oil Line?

29 A The Aleyeska, yes.

30 Q Well, one of the things

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Cross Examination by Scott
The Commissioner

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2 that this Inquiry is supposed to do is to consider the
3 material that is filed by Arctic Gas, assessing the
4 suitability of your route for the gas pipeline for
5 nearby routing of the oil pipeline in terms of the
6 assumption being that an oil pipeline would likely
7 follow if a gas pipeline were built. In terms of the
8 environmental, social and terrain/engineering consequences of the
9 other pipeline and the combined effect of the two
10 pipelines.

11 And it goes on in that vein.
12 Are you saying that the Aleyeska Line has, at least
13 the construction of the Aleyeska Oil Line, will
14 provide us with knowledge that will be of, provide
15 you with knowledge that will be of use to you in
16 engineering this gas pipeline? Or has it already
17 provided knowledge that has already been of use to you
18 in designing this gas pipeline?
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Clark, Hollingshead, McRoberts
Slusarchuk, Morgenstern, Cooper
Hardy, Williams

1 A Well, that second point
2 is certainly true. Their studies, they did very
3 exhaustive studies and they have been available to this
4 group and other groups in Canada. On top of that there
5 are consultants to the NES and CAGSOL group who are
6 also consultants to Aleyeska. There is Dr. Morgenstern,
7 and Dr. Cooper, both are consultant to Aleyeska.

8 Now, despite the fact that
9 they are dealing with a hotline and an oilline, some of
10 these eventualities, sort of black holes on the
11 horizon as the astronomers talk about them, that might
12 occur in the Mackenzie Valley pipeline. They might
13 occur on the Aleyeska line and if they did, completely
14 unanticipated events, they would be very useful to us.

15 And the general performance
16 of what they run into is, could also be quite useful.
17 There is not, there are some major differences you see
18 between the oil line and the gas line, but there are lots of
19 similarities as well sir.

20 THE COMMISSIONER: Well, Mr.
21 Genest, I'm sure will receive a copy of Dr. Casagrandes'
22 article immediately.

23 We'll adjourn until nine in
24 the morning, but Mr. Scott, you might confer today, or
25 tomorrow with counsel and see whether they would be
26 willing to sit one afternoon or one evening this week.
27 I should like to do that if counsel don't object
28 violently to it.

29 Well, we'll adjourn until
30 9:00 A.M. then.

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